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F30 General Vehicle Electronics



BMW Service

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General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:



Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status and national-market versions

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to the European version of left-hand drive vehicles. Some operating elements or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as a result of the equipment specification in specific markets or countries.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application.

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The information contained in this document forms an integral part of the technical training of the BMW Group and is intended for the trainer and participants in the seminar. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the technical data.

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1. Introduction

The vehicle electrical system of the F30 is based for the most part on the current BMW models. This product information bulletin provides an overview of the most important topics relating to the vehicle electrical system.

For more information on the various topics, please refer to the following documents covering the F01/F02:

Topic F30	Training information F01/F02
Bus systems	Bus Systems F01/F02
Voltage supply	Voltage Supply F01/F02
Energy management	Energy Management F01/F02
Car Access System	Car Access System F01/F02
Comfort Access	Comfort Access F01/F02
Central locking system	Central Locking System F01/F02
Power window regulators	Power Window Regulators F01/F02
Exterior mirrors	Exterior Mirrors F01/F02
Glass slide/tilt sunroof	Slide/Tilt Sunroof F01/F02
Alarm system	Alarm System F01/F02
Exterior lights	Exterior Lights F01/F02
Interior lighting	Interior Light F01/F02
Seats	Seats F01/F02
Heating and air conditioning systems	Heating and Air Conditioning Systems F01/F02

In the F30 the centralization of several control units. Two control units are installed in the F30 for this purpose:

- Front Electronic Module (FEM) and
- Rear Electronic Module (REM).

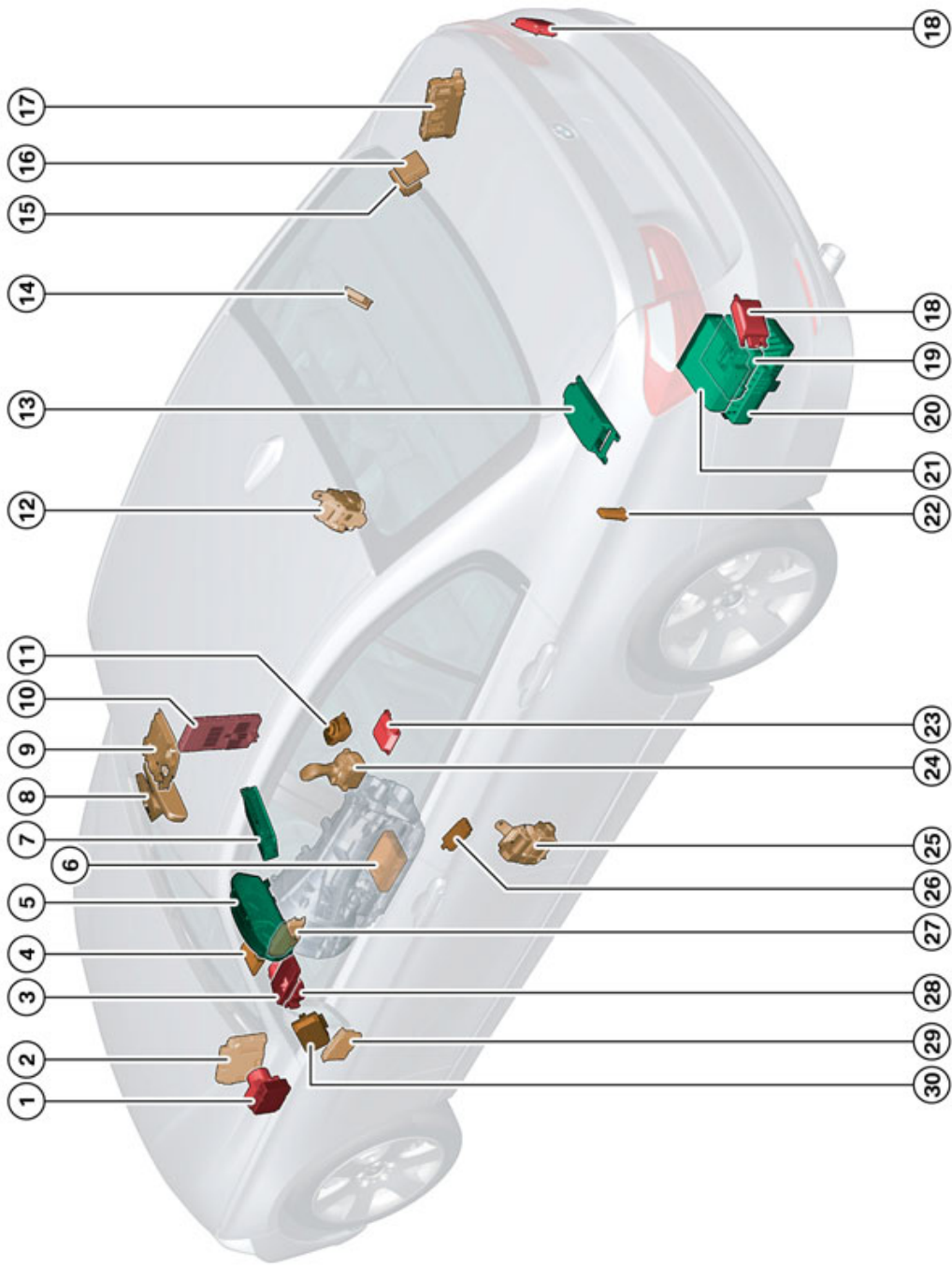
The FEM and REM control units replace the following control units previously used in the E90:

- Junction box (JB)
- Footwell module (FRM)
- Car Access System (CAS)
- Comfort Access (CA)
- Park Distance Control (PDC).

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2. Vehicle Electrical System

2.1. Control units



F30 control unit locations

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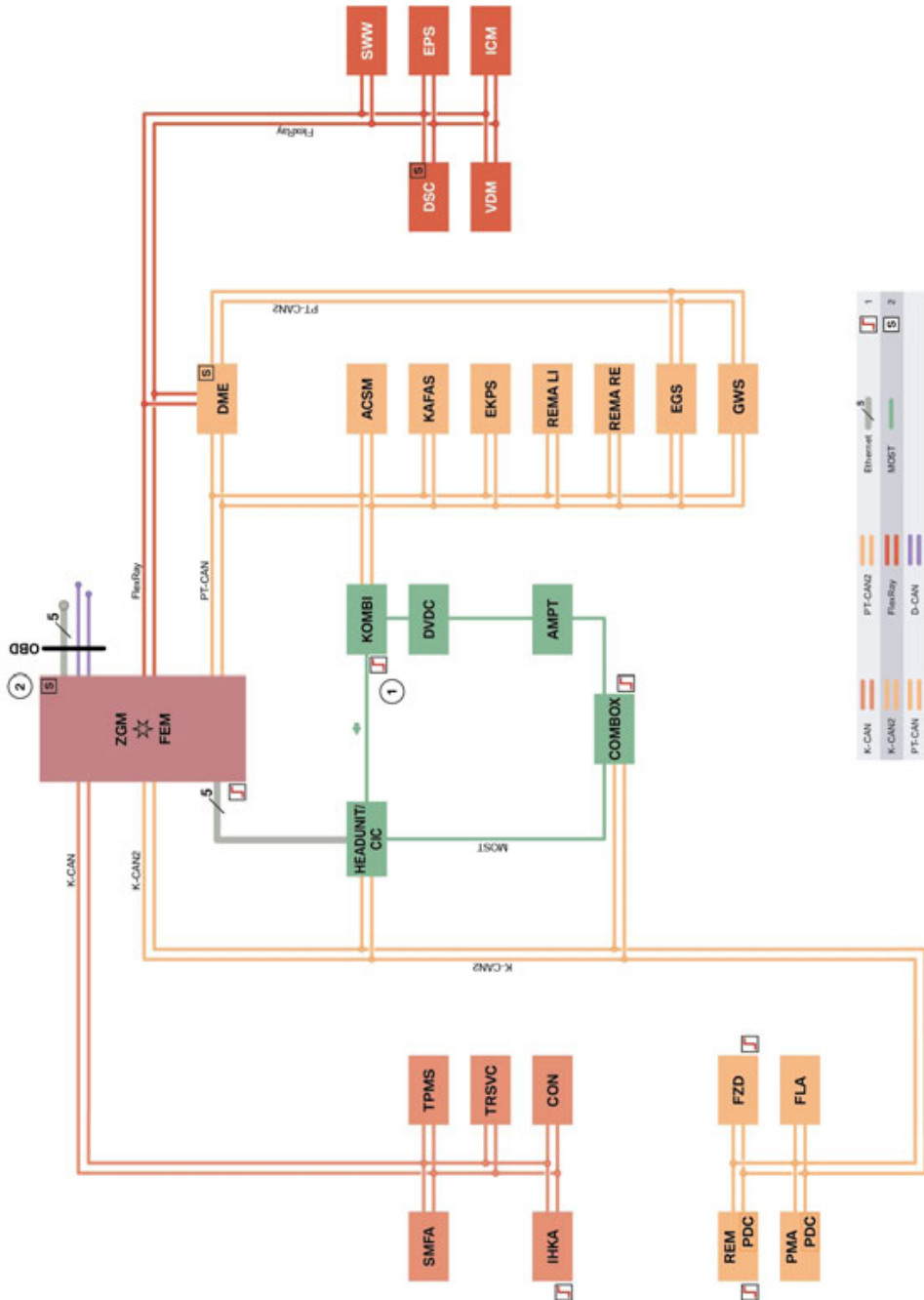
2. Vehicle Electrical System

Index	Explanation
1	Dynamic Stability Control (DSC)
2	Digital Motor Electronics (DME)
3	Vertical Dynamics Management (VDM)
4	Integrated automatic heating / air conditioning (IHKA)
5	Instrument panel (KOMBI)
6	Electronic transmission control (EGS)
7	Head unit
8	High-beam assistant (FLA)
9	Roof function center (FZD)
10	Front Electronic Module (FEM)
11	Controller (CON)
12	Reversible electric automatic reel right (REMA RE) (not for US)
13	Combox
14	Electronic fuel pump control (EKPS)
15	Parking Manoeuvring Assistant (PMA)
16	DC/DC converter
17	Rear Electronic Module (REM)
18	Blind spot detection (SWW)
19	Video module VM (not for US)
20	Hi-Fi amplifier AMP/Top-HiFi amplifier (AMPT)
21	DVD changer (DVDC)
22	Tire Pressure Monitoring System (TPMS)
23	Integrated Chassis Management (ICM)
24	Gear selector switch (GWS)
25	Reversible electric automatic reel left (REMA LI) (not for US)
26	Driver's seat module (SMFA)
27	Advanced Crash Safety Module (ACSM)
28	Electronic Power Steering (electromechanical power steering) (EPS)
29	Camera-based driver support systems (KAFAS)
30	Control unit for camera systems (TRSVK)

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2. Vehicle Electrical System

2.2. Bus overview



F30 bus overview

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2. Vehicle Electrical System

Index	Explanation
1	Control units with wake-up authorization
2	Start-up node control units for starting and synchronizing the FlexRay bus system
ACSM	Advanced Crash Safety Module
AMPT	Top-HiFi amplifier
COMBOX	Combox (Combox emergency call, Multimedia Combox)
CON	Controller
D-CAN	Diagnosis-on-Controller Area Network
DME	Digital Engine Electronics (DME)
DSC	Dynamic Stability Control
DVDC	DVD changer
EGS	Electronic transmission control
EKPS	Electronic fuel pump control
EPS	Electromechanical Power Steering
Ethernet	Cable-based data network technology for local data networks
FEM	Front Electronic Module
FLA	High-beam assistant
FlexRay	Fast, preset and fault-tolerant bus system for use in automotive sector
FZD	Roof function center
GWS	Gear selector lever
HEADUNIT/CIC	Headunit (Car Information Computer or Basic headunit)
ICM	Integrated Chassis Management
IHKA	Integrated automatic heating / air conditioning
K-CAN	Body controller area network
K-CAN2	Body controller area network 2
KAFAS	Camera-based driver assistance systems
KOMBI	Instrument cluster (MOST only with option 6WA)
MOST	Media Oriented System Transport
OBD	On-board diagnosis (diagnostic socket)
PDC	Park Distance Control (with option 5DP, parking manoeuvring assistant: integrated in the parking manoeuvring assistant control unit, otherwise integrated in the Rear Electronic Module control unit)
PMA	Parking manoeuvring assistant
PT-CAN	Powertrain controller area network
PT-CAN2	Powertrain controller area network 2
RAD	Radio

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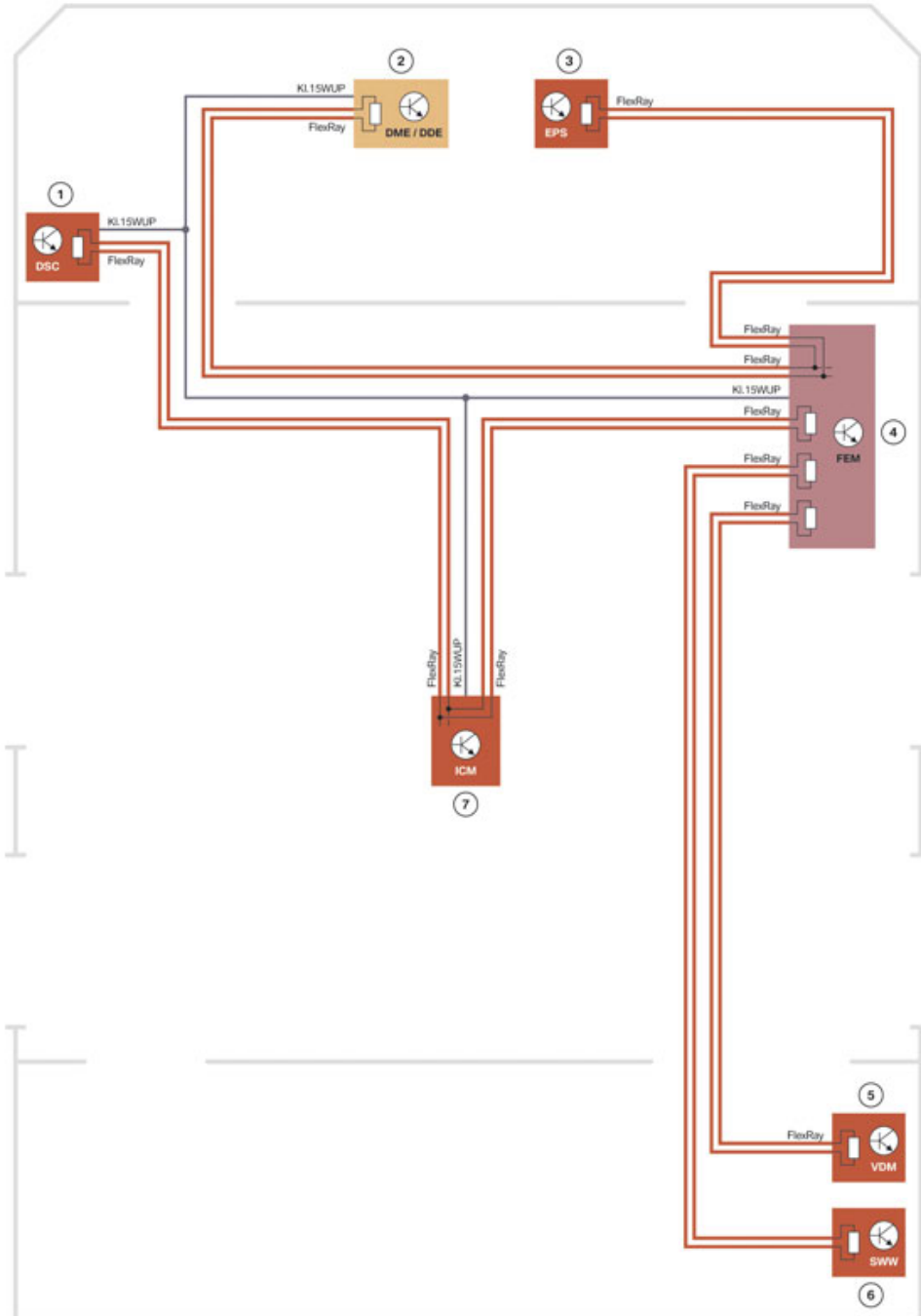
2. Vehicle Electrical System

Index	Explanation
REM	Rear Electronic Module
REMA LI	Reversible electromotive automatic reel, left (not US)
REMA RE	Reversible electromotive automatic reel, right (not US)
SMFA	Seat module, driver
SWW	Lane change warning
TPMS	Tire Pressure Monitoring System
TRSVK	Control unit for all-round vision camera
VDM	Vertical Dynamics Management
ZGM	Central gateway module

The FlexRay is shown in a simplified form in the overview of the bus systems. The following system wiring diagram shows the actual physical layout (topology).

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2. Vehicle Electrical System



F30 system wiring diagram, FlexRay

TE11-1038

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2. Vehicle Electrical System

Index	Explanation
1	Dynamic Stability Control DSC
2	Digital Engine Electronics (DME) or Digital Diesel Electronics (DDE) (not US)
3	Electronic Power Steering (electromechanical power steering) EPS
4	Front Electronic Module (FEM)
5	Vertical Dynamics Management (VDM)
6	Lane change warning SWW
7	Integrated Chassis Management (ICM)

FlexRay is used in the F30 as the system bus for networking of the systems that control the dynamic handling characteristics and engine control. A so-called star coupler with four bus drivers is located in the central gateway module (ZGM), which is integrated in the new Front Electronic Module (FEM). The bus drivers forward the data of the control units via the communication controller to the ZGM. The FlexRay control units are connected to these bus drivers.

Terminating resistors are used on both ends of the data lines to avoid reflections on the lines.

The body controller area network 2 (K-CAN2) facilitates communication between control units with a high data transfer rate (500 kBit/s). The K-CAN2 is also connected to the other bus systems via the central gateway module (ZGM).

The powertrain controller area network 2 (PT-CAN2) creates a redundancy to the powertrain controller area network (PT-CAN) in the area of engine and transmission control.

The F30 has Ethernet access in order to be able to program the complete vehicle quickly. Due to the very high data transfer rate of the Ethernet (100 MBit/s), the programming access via the MOST system could be discontinued. The headunit also obtains an Ethernet connection, via which the programming for MOST devices is effected.

The FEM/ZGM assumes the task in the F30 of distributing the telegrams internally within the vehicle to the buses and of forwarding to the headunit via K-CAN2. The headunit then provides for distribution on the MOST.

The navigation data of the CIC High (Navigation Professional option 609) are stored on its hard disk. These navigation data are updated via the Ethernet access at the OBD II connection and the internal vehicle Ethernet connection between ZGM and CIC.

The D-CAN at the OBD II connection is used in the dealer organization to program vehicles at "authorized third parties". Legal provisions stipulate that all control units must be able to be programmed via the D-CAN. HDD update is an exception.

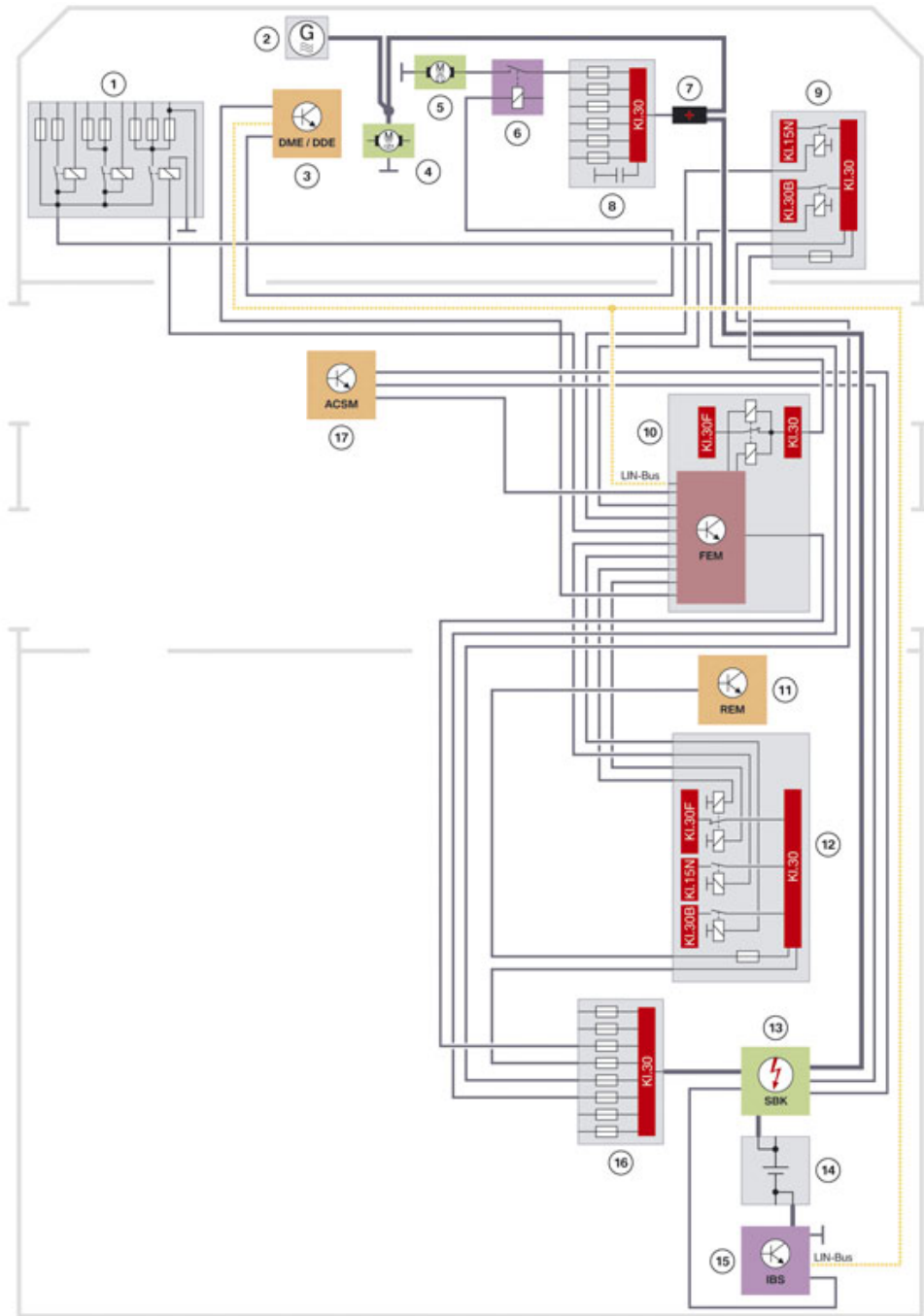
2.3. OBD II diagnostic access

The diagnostic socket is situated as in other BMW vehicles on the left A-pillar. Both vehicle diagnosis via the D-CAN and programming access via the Ethernet to the vehicle are made available via the OBD II interface.

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3. Voltage Supply

3.1. System wiring diagram



F30 system wiring diagram, voltage supply

TE11-1163

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3. Voltage Supply

Index	Explanation
1	Power Distribution Module (PDM)
2	Alternator
3	Digital Engine Electronics (DME) or Digital Diesel Electronics (DDE) not US
4	Starter motor
5	Electric fan
6	Relay for electric fan
7	B+ jump start terminal point
8	Power distribution box, front
9	Power distribution box, engine compartment
10	Front Electronic Module (FEM)
11	Rear Electronic Module (REM)
12	Power distribution box, luggage compartment
13	Safety battery terminal (SBK)
14	Battery
15	Intelligent battery sensor (IBS)
16	Battery power distribution box
17	Crash Safety Module (ACSM)
KI.30	Terminal 30
KI.30B	Terminal 30 basic operation
KI.15N	Ignition (after-run)
KI.30F	Terminal 30, fault-dependent

3.2. Components

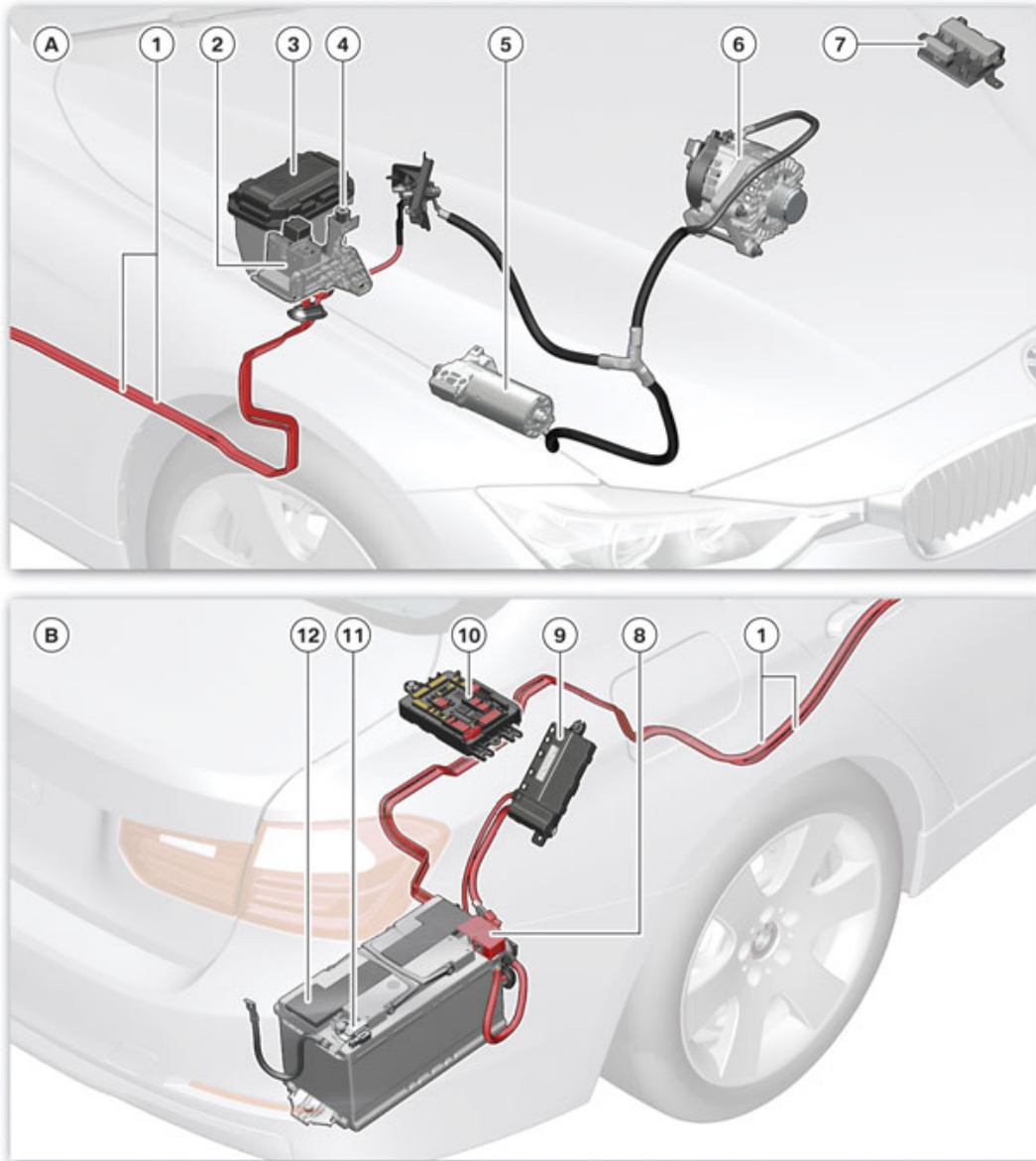
The voltage supply of the F30 comprises the following components:

- Battery
- Intelligent battery sensor (IBS)
- Safety battery terminal (SBK)
- Power Distribution Module (PDM)
- Power distribution box, front, with B+ jump start terminal point
- Power distribution box, engine compartment
- Power distribution box, luggage compartment
- Battery power distribution box

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3. Voltage Supply

- Battery cables
- Starter motor
- Alternator.



Voltage supply components

TE11-1041

F30 General Vehicle Electronics

3. Voltage Supply

Index	Explanation
A	Voltage supply components, front
B	Voltage supply components, rear
1	Main battery cables
2	Power distribution box, front
3	Power distribution box, engine compartment
4	B+ jump start terminal point
5	Starter motor
6	Alternator
7	Power Distribution Module (PDM)
8	Safety battery terminal (SBK)
9	Battery power distribution box
10	Power distribution box, luggage compartment
11	Intelligent battery sensor (IBS)
12	Battery

3.2.1. Battery

The battery is located in the luggage compartment to the right behind a removable oddments tray. It is a wear-resistant 90 Ah AGM battery.



Index	Explanation
1	Removable oddments tray
2	Battery

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3. Voltage Supply

3.2.2. Wiring harness

There is an increasing use of aluminium lines for the voltage supply in the F30. Lower weight and lower costs are the reason for the increased use of aluminium. The B+ underfloor cable made from solid aluminium with a flat 59 mm² profile section runs from the B+ transfer terminal point (rear) to the B+ jump start terminal point (front).

Connectors with a secondary lock (CPA, Connector Position Assurance) are used at both the engine compartment power distribution box and the luggage compartment power distribution box. This provides for significantly more reliable contacting. Thinner cables with a cross-section of just 0.22 mm² are used in the F30.

The following tables shows the distribution of copper and aluminium cables in the vehicle:

Location	Copper cables	Aluminium cables
Supply, battery power distribution box to luggage compartment power distribution box	10 mm ²	
Supply, battery power distribution box to REM	6 mm ²	
Supply, battery power distribution box to FEM		27 mm ²
Supply, battery power distribution box to engine compartment power distribution box		27 mm ²
Supply, battery power distribution box to units compartment partition wall (PDM line)		17 mm ²

The cross-section of the line from the power distribution box at the front to the EPS and the ground line EPS depends on the steering of the vehicle:

- 27 mm² aluminium lines for EPS High (for BMW 328i and 335i) or for EPS+ (for vehicles with variable sport steering (option 2VL)).

For more information on the Electronic Power Steering EPS, please refer to the training information "F30 Chassis and Suspension".

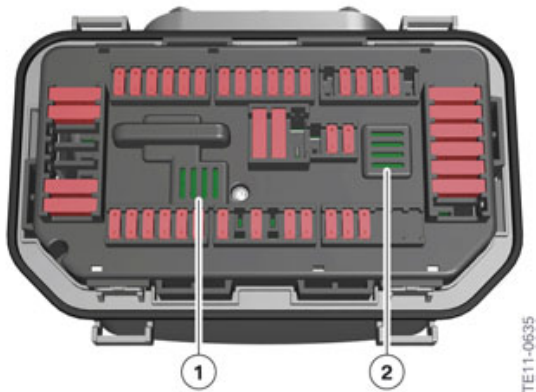
3.2.3. Power distribution boxes

Two separate power distribution boxes - adapted to the FEM/REM concept - are installed. The engine compartment power distribution box is located on the right side of the engine compartment directly on the front bulkhead. The battery power distribution box is no longer located at the battery, but is secured in front of the battery at the wheel arch.

A few functions where load relays are integrated in the FEM/REM are fuse-protected directly in the FEM or REM. This also applies to the terminal 30F controlled exclusively by the FEM.

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3. Voltage Supply

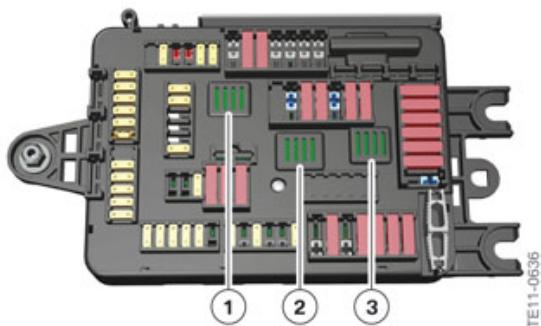


Power distribution box, engine compartment

Index	Explanation
1	Terminal 15N
2	Terminal 30B



When working on the engine compartment power distribution box, it is essential to ensure when closing the cover that the four fastenings engage correctly so that the power distribution box is safely protected against leaks.



Power distribution box, luggage compartment

Index	Explanation
1	Terminal 15N
2	Terminal 30F
3	Terminal 30B

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3. Voltage Supply

3.3. Stabilization of the vehicle electrical system

In vehicles equipped with the automatic engine start-stop function (MSA), starting operations, and therefore voltage dips in the vehicle electrical system, occur more frequently. A DC/DC converter is installed in these vehicles, depending on the vehicle equipment specification, to protect specific voltage-sensitive electrical components.

The DC/DC converter supplies a constant voltage to terminals 30B_DC/DC, also during the starting operation.

One DC/DC converter is installed in conjunction with one of the following items of optional equipment:

- Navigation system Professional (optional extra 609)
- Harman Kardon Surround Sound System (option 688).

3.4. Energy management

The energy management of the F30 has been extended to include the functions already added in the F25.

3.4.1. Charge state indicator

If the F30 is in transport mode, the battery's state of charge is continuously displayed when in operation. The carrier can therefore charge the battery on time in order to prevent deep discharging of the battery, and therefore damage to the battery. Before the vehicle is handed over, the dealer can check whether the battery is sufficiently charged or whether it needs to be replaced.

3.4.2. Influence of steering power

The power consumption of the electronic power steering (electromechanical power steering) EPS is extremely high. In order to avoid a brief reduction in the steering servo availability, the energy management of the F30 anticipates and responds to steering-intensive driving manoeuvres (parking or three-point turns). To do this, specific input variables (e.g. driving speed, brake pedal operation and steering angle) are evaluated. The energy management can implement the following measures:

- Raise the idling speed and adjust the ignition timing to increase the engine torque
- Increase the vehicle voltage via the alternator
- Turn off convenience functions (heated rear window, outside mirror heating system and seat heating).

3.4.3. Power distribution box, front

A condenser is installed in the front power distribution box to reduce the harmonic content in the vehicle voltage caused by the alternator.

If a faulty electric fan is replaced, the harmonic content of the voltage must also be measured. If the harmonic content is too high, this indicates that a condenser is faulty and must be replaced.

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3. Voltage Supply

3.5. Supply to EPS

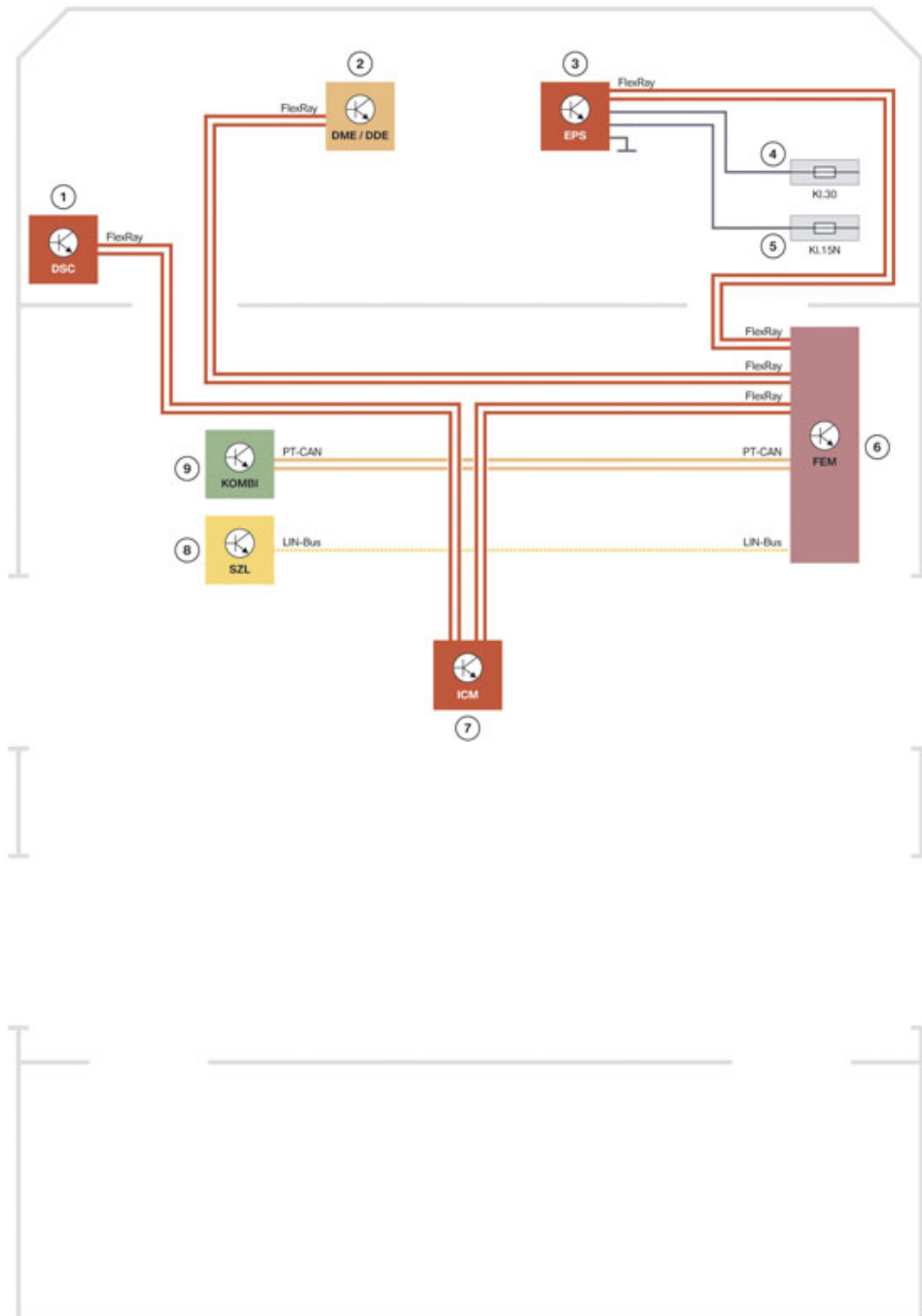
The F30 is equipped as standard with electromechanical power steering (EPS) with servotronic or variable sport steering (option 2VL) which can be ordered as optional equipment.

The EPS makes possible a reduction of the average fuel consumption by approx. 3 % in comparison to conventional hydraulic steering. This helps reduce carbon dioxide emissions.

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3. Voltage Supply

3.5.1. System wiring diagram



F30 System wiring diagram, EPS (electromechanical power steering)

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3. Voltage Supply

Index	Explanation
1	Dynamic Stability Control DSC
2	Digital Engine Electronics (DME) or Digital Diesel Electronics (DDE) not US
3	Electronic Power Steering (electromechanical power steering) EPS
4	Power distribution box, front
5	Power distribution box, engine compartment
6	Front Electronic Module (FEM)
7	Integrated Chassis Management (ICM)
8	Steering column switch cluster (SZL)
9	Instrument cluster (KOMBI)
Kl.30	Terminal 30
Kl.15N	Ignition (after-run)

3.6. Battery Guard

The Battery Guard function detects critical states of charge which could jeopardize engine starting and sends this relevant information directly to the BMW Service authorized workshop. The customer is then notified by BMW Service department (via phone or email) of the required service.

The optional equipment BMW Assist with enhanced Bluetooth and USB (option 6NL) and an active BMW ConnectedDrive agreement are required for the Battery Guard function.

The BMW TeleServices Battery Guard Call is automatically activated by the vehicle under the following conditions:

- If the battery voltage reaches the bottom of the starting ability limit because a bus wake-up signal is present, sleep mode is prevented or there is a standby current violation the BMW TeleServices Battery Guard informs the BMW Service authorized workshop in defined cases at the next vehicle start-up (terminal 15 active). It can then proactively contact the customer and arrange a service appointment to eliminate the cause. This function is available for the series launch of the F30 in Germany, the Netherlands and Austria, the USA and Canada.

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4. Front Electronic Module (FEM)

The Front Electronic Module FEM is used in the F30, similar to the F20. The FEM replaces the following control units:

- Junction box (JB)
- Car Access System (CAS)
- Comfort Access (CA)
- Footwell module (FRM).

The ZGM is integrated as an independent control unit in the FEM.

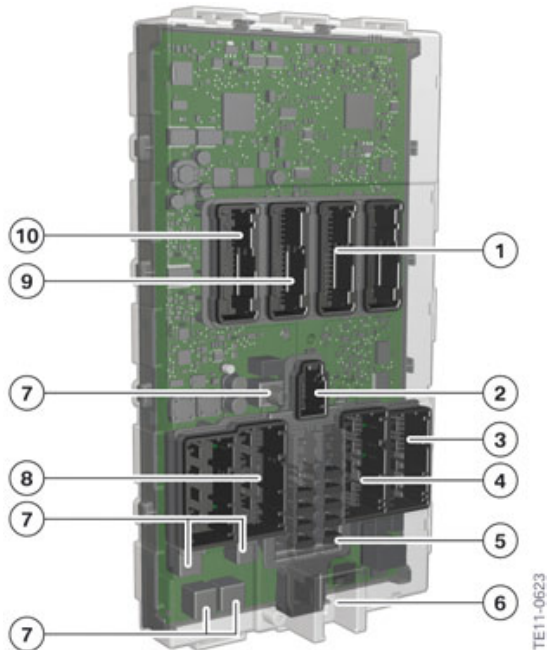
The FEM is located at the A-pillar of the front passenger side.



F30 FEM installation location

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4. Front Electronic Module (FEM)



Front Electronic Module (FEM)

Index	Explanation
1	Connector (54-pin)
2	Connector (12-pin)
3	Connector (42-pin)
4	Connector (54-pin)
5	Fuses
6	Connector (1-pin, B+ supply)
7	Relay
8	Connector (54-pin)
9	Connector (54-pin)
10	Connector (54-pin)

The following functions are protected by fuses in the FEM:

- Steering column switch cluster (SZL), operating facility for driver assistance systems, operating facility for lights
- Headlight driver module for LED, Rear Electronic Module (REM)
- OBD II connector, IHKA

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4. Front Electronic Module (FEM)

- Outside door handle electronics
- Power window regulator
- Central Locking system.

The following functions are switched by relays in the FEM:

- Power window regulator, driver
- Power window regulator, front passenger
- Central locking system
- Headlight cleaning system
- Starter motor
- Horn
- Wiper speed 1/2.

The following table provides an overview of the FEM functions when compared with the relevant control units:

Function in FEM	Control unit in E90
A/C activation (actuators, sensors)	JB
Wash/wipe system	JB
Steering column switch cluster (SZL)	JB
Central locking system (ZV)	JB
Rain-light-solar-condensation sensor	JB
Inside mirror	FZD
Interior lighting	FRM
Exterior lights	FRM
Headlight beam throw adjustment	FRM
Power window regulators, front	FRM
Exterior mirrors	FRM
Switch block, driver's door	FRM
Mirror heating	FRM
Comfort Access (CA)	CAS
Remote control services (FBD)	CAS
Electronic immobilizer (EWS)	CAS
Terminal control	CAS
Intelligent battery sensor (IBS)	CAS
Central gateway module (ZGM)	ZGM

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4. Front Electronic Module (FEM)

4.1. Central gateway module (ZGM)

The task of the ZGM is to connect all the data bus systems to each other. By connecting them in this way, it is possible to use information from the individual bus systems on a generalized level. The ZGM is able to implement different protocols and speeds on other bus systems. The programming data are transmitted by Ethernet to the vehicle via the ZGM.

The ZGM is integrated as a module in the FEM in the electrical system architecture 2020. It is viewed as a control unit within a control unit.

The ZGM has its own complete software unit, comprising bootloader and application, and its own diagnosis address. The ZGM is not codable. The bootloader and the application software can be flashed independently of the FEM.

4.2. Control unit replacement

A counter exchange with control units from other vehicles is not possible. A control unit can only be ordered as a spare part. It is important to bear in mind in this respect that the FEM and the DME are supplied already coded to the vehicle. The advantage of this is that only the control unit is replaced and there is no need to adjust the electronic immobilizer.

In contrast, an adjustment must be made to the electronic transmission control after the control unit is replaced. In the course of this adjustment the FEM transmits the individual code to the electronic transmission control unit.

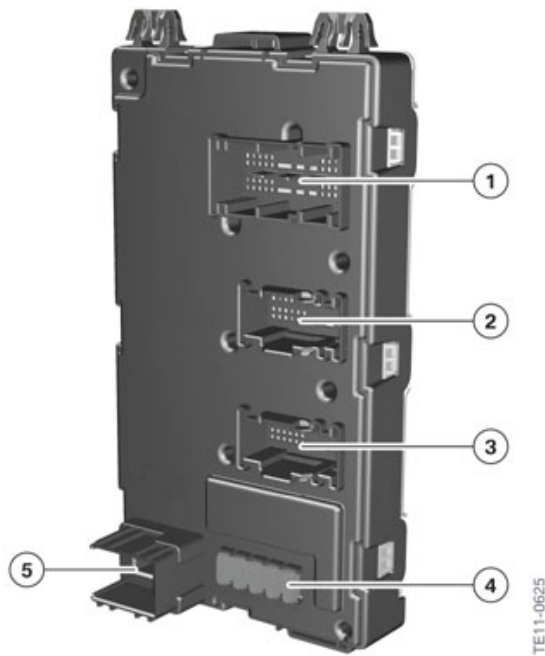
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5. Rear Electronic Module (REM)

The Rear Electronic Module (REM) assumes the functions of JB and PDC in the right of the luggage compartment of the F30.



F30 REM installation location



Rear Electronic Module (REM)

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5. Rear Electronic Module (REM)

Index	Explanation
1	Connector (54-pin)
2	Connector (26-pin)
3	Connector (26-pin)
4	Fuses
5	Connector (1-pin, B+ supply)

The following table provides an overview of the REM functions when compared with the relevant control units:

Function in REM	Control unit in E90
Fill level sensor	JB
Heated rear window	JB
Power window regulators, rear	JB
Seat heating	JB
Rear lights	FRM
Park Distance Control (PDC)	PDC

The following functions are protected by fuses in the REM:

- Heated rear window
- Power window regulators, rear
- Roller sunblind.

The following functions are switched by relays in the REM:

- Heated rear window
- Power window regulators, rear
- Roller sunblind.

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6. CAS Functions

There are two distinct systems concerned with vehicle access:

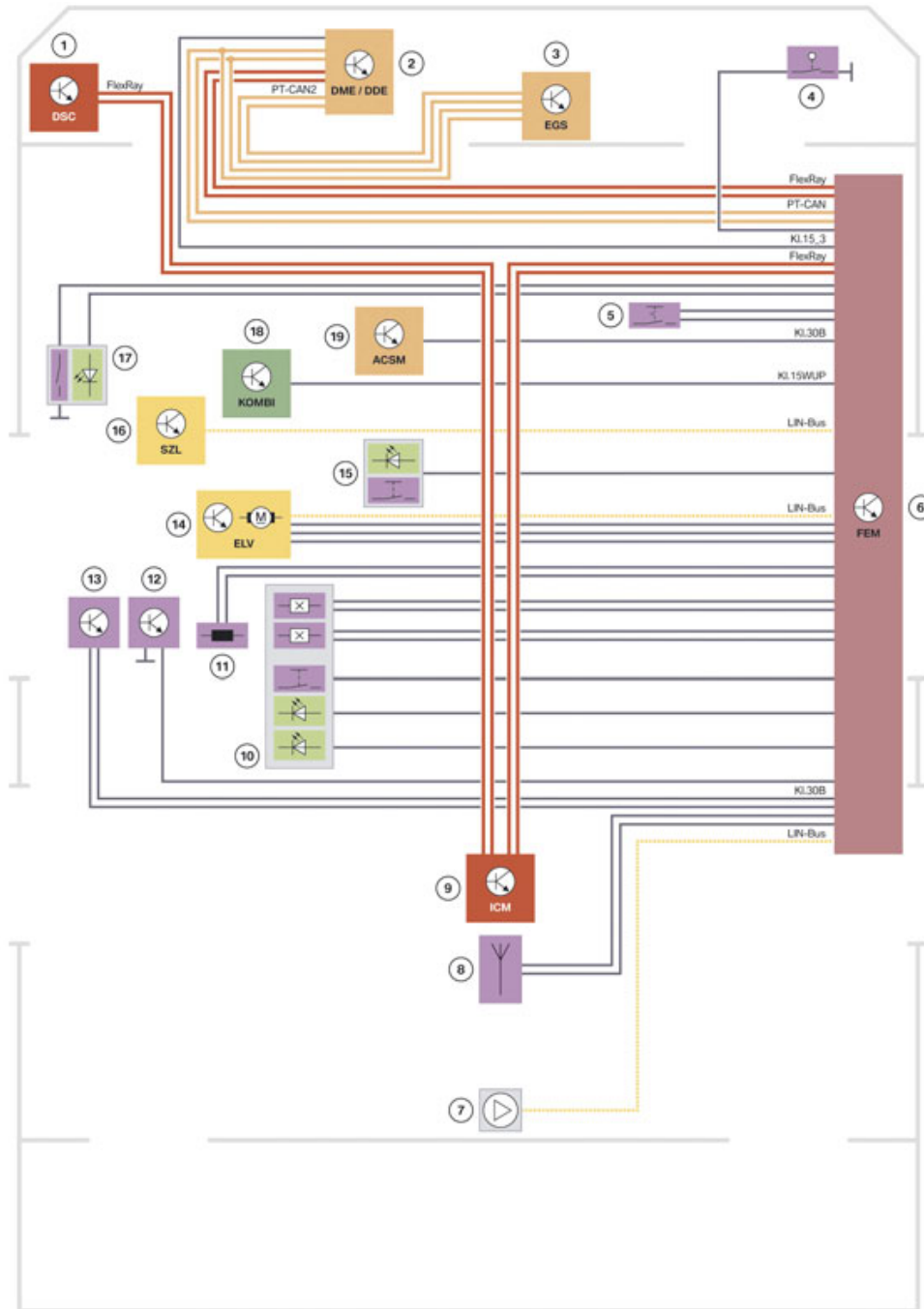
- Basic access, central locking system
- Comfort Access (option 322).

The entire access control of the previous CAS control unit is integrated entirely in the FEM. Mechanical access to the vehicle is confined to opening the driver's door lock. Complete locking of the vehicle is thus not possible (except with option 302 Alarm system).

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6. CAS Functions

6.1. System wiring diagram



F30 system wiring diagram, Car Access System

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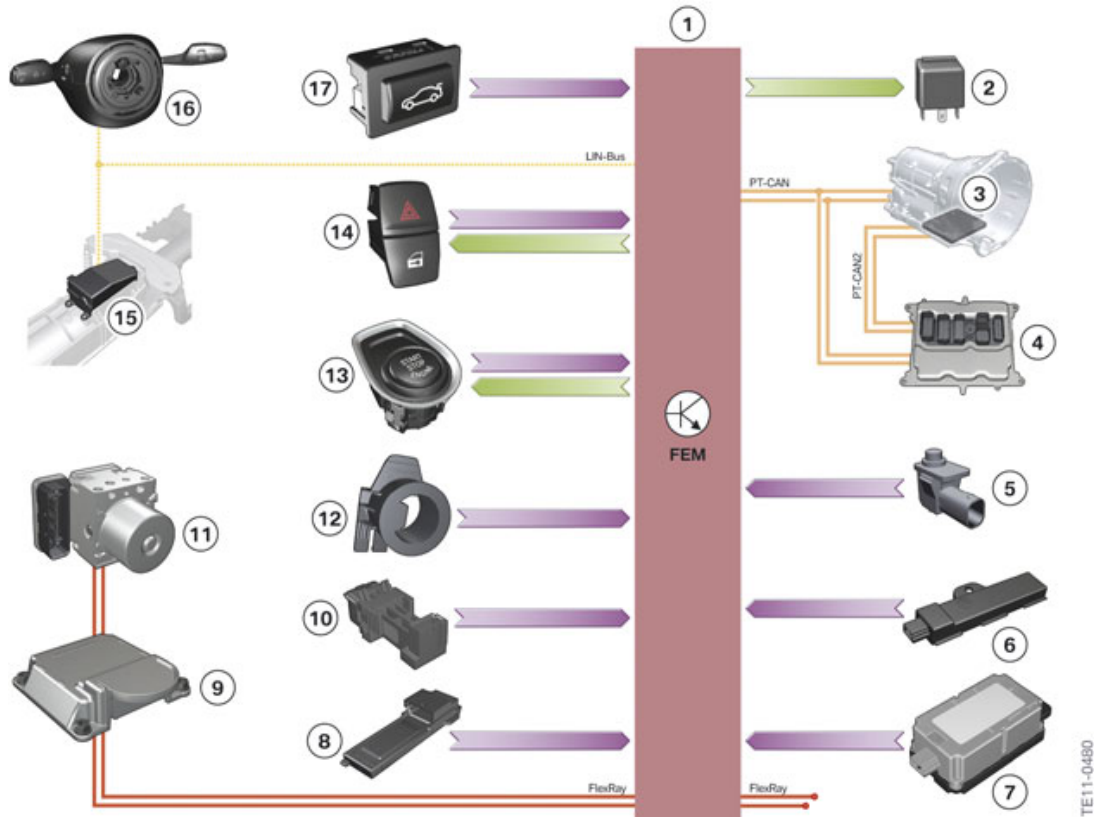
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6. CAS Functions

Index	Explanation
1	Dynamic Stability Control DSC
2	Digital Engine Electronics (DME) or Digital Diesel Electronics (DDE) not US
3	Electronic transmission control (EGS)
4	Engine compartment lid contact switch
5	Hotel position switch (only in US version)
6	Front Electronic Module (FEM)
7	Remote control receiver
8	Interior antenna (front)
9	Integrated Chassis Management (ICM)
10	START-STOP button
11	Ring antenna (transponder coil)
12	Brake light switch
13	Clutch switch (with manual gearbox only)
14	Electronic steering lock (ELV) not US
15	Button for central locking system/hazard warning switch
16	Steering column switch cluster (SLZ)
17	Trunk pushbutton
18	Instrument cluster (KOMBI)
19	Crash Safety Module (ACSM)

F30 General Vehicle Electronics

6. CAS Functions



F30 Input/output, Car Access System

Index	Explanation
1	Front Electronic Module (FEM)
2	Relay, term. 15N, term. 30B, term. 30F
3	Electronic transmission control (EGS) (start enable)
4	Digital Engine Electronics (DME) or Digital Diesel Electronics not US (DDE) (start enable)
5	Engine compartment lid contact switch
6	Interior antenna (front)
7	Remote control receiver
8	Clutch switch (with manual gearbox only)
9	Integrated Chassis Management (ICM)
10	Brake light switch (BLS)
11	Dynamic Stability Control DSC
12	Ring antenna (transponder coil)
13	START-STOP button

F30 General Vehicle Electronics

6. CAS Functions

Index	Explanation
14	Button for central locking system/hazard warning switch
15	Electronic steering lock (ELV) (start enable) not US
16	Steering column switch cluster (SZL)
17	Trunk pushbutton
Kl.15N	Ignition (after-run)
Kl.30B	Terminal 30 basic operation
Kl.30F	Terminal 30, fault-dependent

6.2. Overview of functions

There is no longer an insertion slot in the F30. The vehicle can already be started without a key as standard. This function is called "Passive Go" (drive authorization). However, to gain access to the vehicle, it is still necessary to actuate the ID transmitter.

The following CAS functions are integrated in the F30:

- Comfort Access
The optional equipment Comfort Access contains the "Comfort Entry" and "Comfort Exit" functions. The "Passive Go" function comes as standard.
- Central locking system
- Power window regulators
- Slide/tilt sunroof
- Terminal control
- Electronic immobilizer.

Further CAS functions are among others:

- Vehicle data storage
- Data transfer for Condition Based Service (CBS).

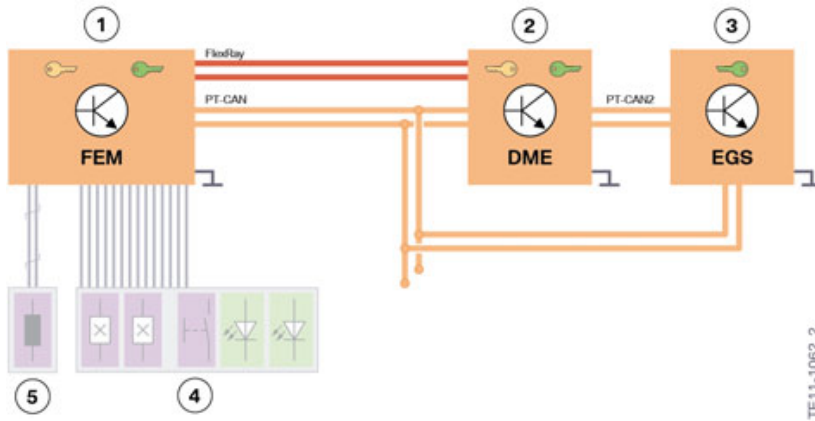
The CAS functions correspond to those in the F01 and are described in the "Car Access System F01/ F02" training information.

With regard to start enable by the electronic immobilizer (also called Challenge Response), some changes have been made from the F01. What is new is the omission of the CAS bus, because PT-CAN and FlexRay already provide redundancy of data transfer between FEM and DME.

The emergency-start function (stopping the ID transmitter at the ring antenna on the steering column) is already known from the F01.

F30 General Vehicle Electronics

6. CAS Functions



F30 Redundancy in data transfer

Index	Explanation
1	Front Electronic Module (FEM)
2	Digital Engine Electronics (DME) or Digital Diesel Electronics (DDE) not US
3	Electronic transmission control (EGS)
4	START-STOP button
5	Ring antenna (transponder coil)

F30 General Vehicle Electronics

7. Comfort Access

The Comfort Access function is integrated in the Front Electronic Module (FEM).

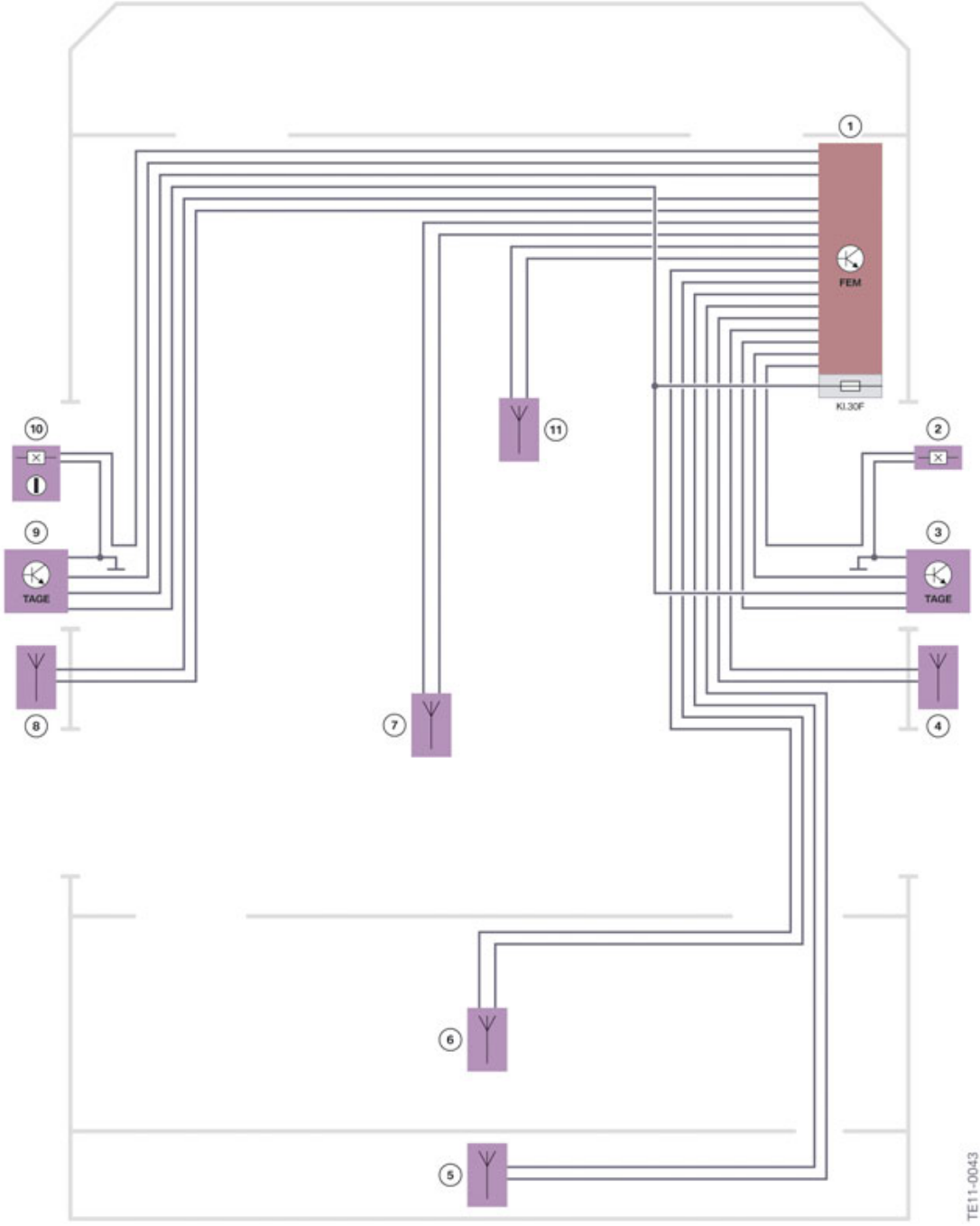
Comfort Access contains the following functions:

- **Passive Entry (access authorization)**
facilitates access to the vehicle without active use of the ID transmitter
- **Passive Go (drive authorization)**
enables the vehicle to be started when there is a valid ID transmitter in the passenger compartment
- **Passive Exit (locking authorization)**
enables the vehicle to be locked without active use of the ID transmitter
- **Hands-free trunk lid opening**
makes it possible for hands-free opening of the trunk lid by a foot movement under the rear bumper.

F30 General Vehicle Electronics

7. Comfort Access

7.1. System wiring diagram



F30 system wiring diagram, Comfort Access

TE11-0043

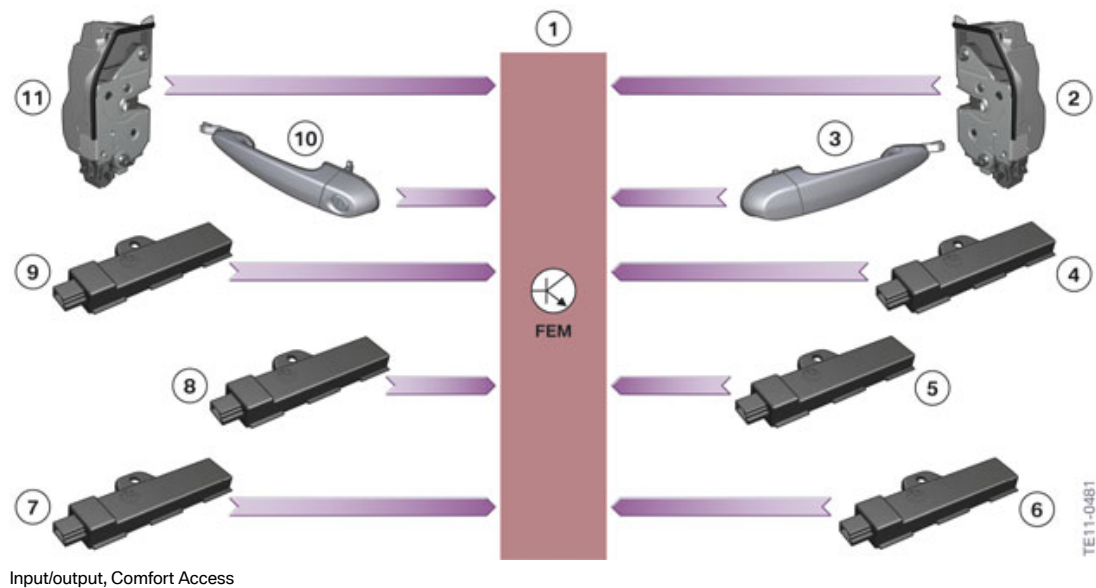
F30 General Vehicle Electronics

7. Comfort Access

Index	Explanation
1	Front Electronic Module (FEM)
2	Door contact, front passenger side
3	Outside door handle electronics (TAGE) on front passenger side
4	Comfort Access antenna, side sill, right
5	Comfort Access antenna, bumper, rear
6	Comfort Access antenna, luggage compartment
7	Comfort Access antenna, passenger compartment, rear
8	Comfort Access antenna, side sill, left
9	Outside door handle electronics (TAGE) on driver's side
10	Door contact, driver's side
11	Comfort Access antenna, passenger compartment, front
Kl.30F	Terminal 30, fault-dependent

For the Comfort Access function the Front Electronic Module (FEM) activates the transmitter antennae for the exterior and passenger compartment.

The outside door handle electronics (TAGE) are also read in by the FEM.



F30 General Vehicle Electronics

7. Comfort Access

Index	Explanation
1	Front Electronic Module (FEM)
2	Door contact, front passenger side
3	Outside door handle electronics (TAGE) on front passenger side
4	Comfort Access antenna, side sill, right
5	Comfort Access antenna, passenger compartment, rear
6	Comfort Access antenna, luggage compartment
7	Comfort Access antenna, bumper, rear
8	Comfort Access antenna, passenger compartment, front
9	Comfort Access antenna, side sill, left
10	Outside door handle electronics (TAGE) on driver's side
11	Door contact, driver's side

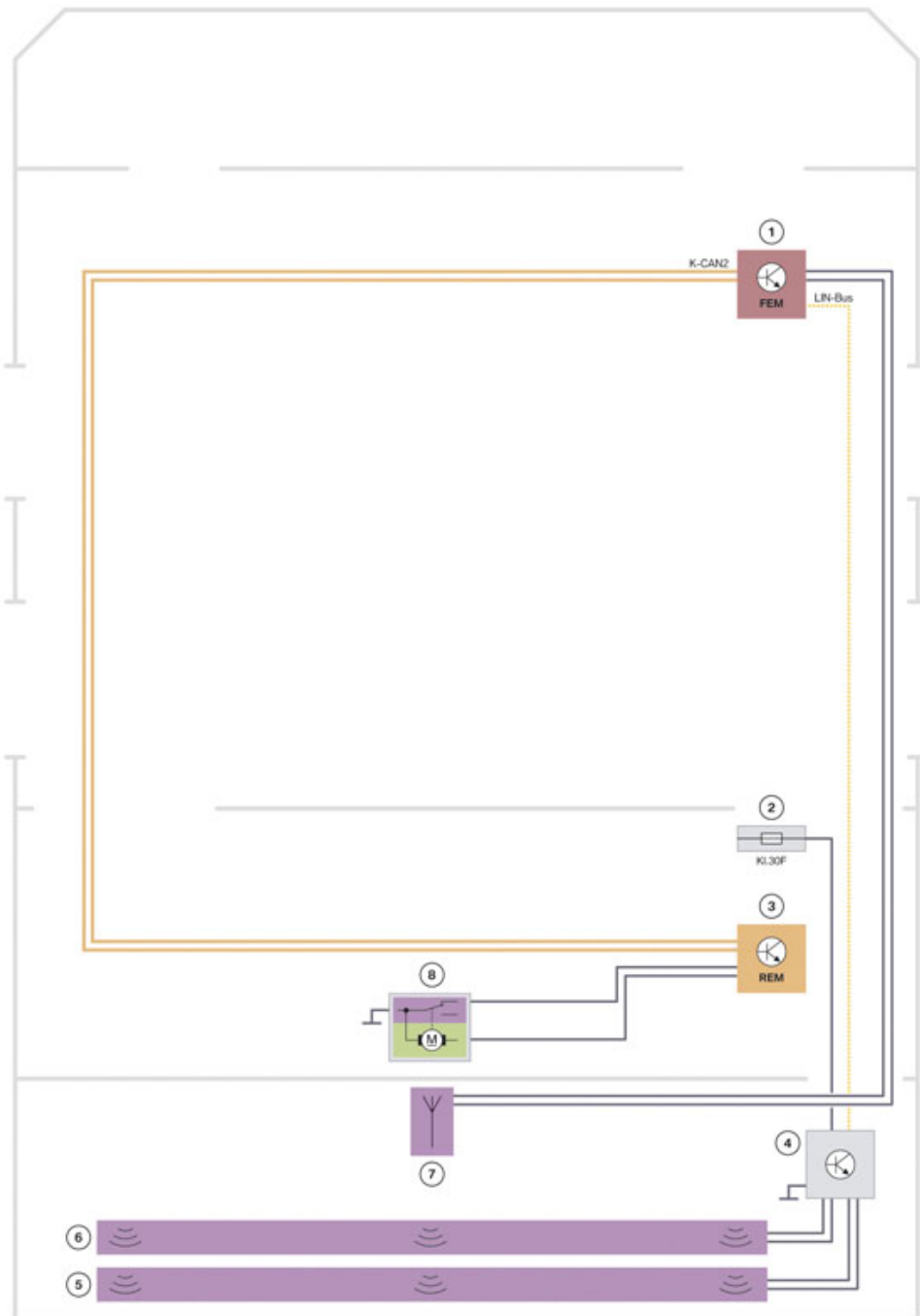
The components and functionality of Comfort Access are familiar from the current BMW models.

F30 General Vehicle Electronics

7. Comfort Access

7.2. Hands-free trunk lid opening

7.2.1. System wiring diagram



F30 system wiring diagram for hands-free trunk lid opening

TE11-1155

F30 General Vehicle Electronics

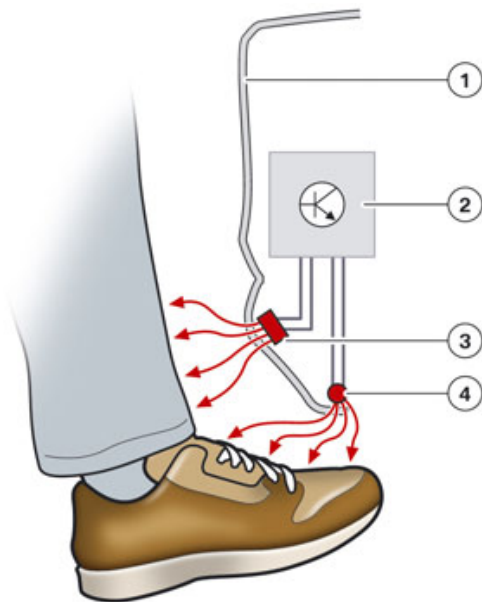
7. Comfort Access

Index	Explanation
1	Front Electronic Module (FEM)
2	Power distribution box, luggage compartment
3	Rear Electronic Module (REM)
4	Control unit for hands-free trunk lid opening
5	Sensor at top for hands-free trunk lid opening
6	Sensor at bottom for hands-free trunk lid opening
7	Comfort Access antenna, bumper, rear
8	Trunk lock
KI.30F	Terminal 30, fault-dependent

7.2.2. Functional description

The hands-free trunk lid opening is another operating element for the trunk for the customer.

The operation is effected by means of targeted foot movement to and from the bumper. Two sensors detect the movement via a capacitive measurement.



F30 hands-free trunk lid opening by foot movement

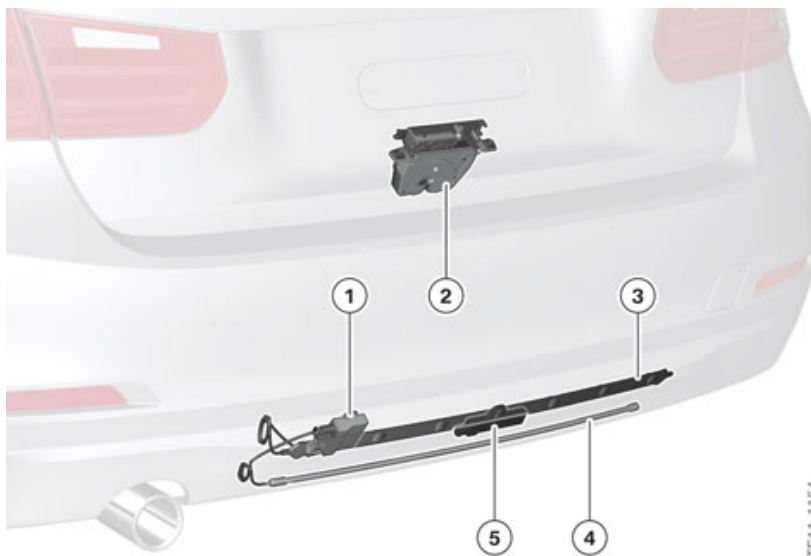
F30 General Vehicle Electronics

7. Comfort Access

Index	Explanation
1	Rear bumper
2	Control unit for hands-free trunk lid opening
3	Sensor at top for hands-free trunk lid opening
4	Sensor at bottom for hands-free trunk lid opening

The following components are involved in the function:

- FEM
- REM
- Trunk lock
- Control unit for hands-free trunk lid opening
- Comfort Access antenna, bumper, rear
- Two sensors.



F30 sensor for hands-free trunk lid opening

Index	Explanation
1	Control unit for hands-free trunk lid opening
2	Trunk lock
3	Sensor at top for hands-free trunk lid opening
4	Sensor at bottom for hands-free trunk lid opening
5	Comfort Access antenna, bumper, rear

F30 General Vehicle Electronics

7. Comfort Access

The two sensors are connected to the evaluation electronics and constantly measure the capacity. A comparison of the time characteristic of the measured capacities permits the identification of a certain movement pattern.

A targeted foot movement to and from the bumper can be detected herefrom. The top sensor detects the shin, the bottom sensor the toes.

The detection range is between the rear lights.

The sensors are secured in the inside of the rear bumper.

The trunk opens regardless if it was locked or unlocked.



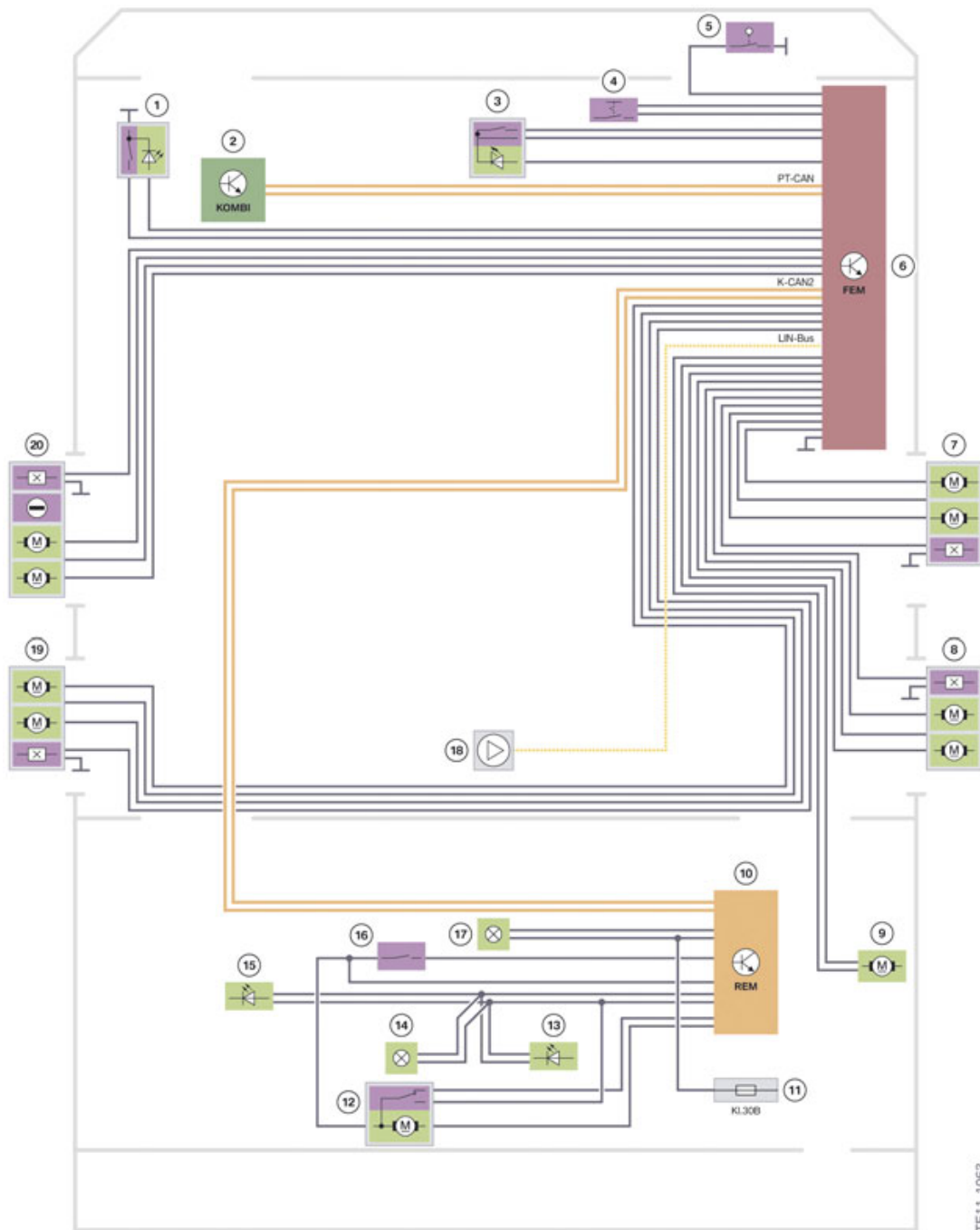
This system might also be referred to in ISTA as:

- Smart Opener
 - Contact-less Tailgate
 - Contact-free Tailgate
 - Non-contact Rear Lid
 - Touch-less Tailgate Opening
 - Hands-free Trunk Lid Opening
-

F30 General Vehicle Electronics

8. Central Locking System

8.1. System wiring diagram



F30 system wiring diagram, central locking system

F30 General Vehicle Electronics

8. Central Locking System

Index	Explanation
1	Trunk pushbutton (fitted as standard, depending on version)
2	Instrument cluster (KOMBI)
3	Button for central locking system/hazard warning switch
4	Hotel position switch (only in US version)
5	Engine compartment lid contact switch
6	Front Electronic Module (FEM)
7	Door contact, central locking system on front passenger side, front
8	Door contact, central locking, passenger side, rear
9	Central locking system, fuel filler flap
10	Rear Electronic Module (REM)
11	Power distribution box, luggage compartment
12	Trunk contact with trunk lock
13	Trunk light
14	Trunk light
15	Trunk light
16	Trunk pushbutton on the outside of the trunk
17	Luggage compartment light
18	Remote control receiver
19	Door contact, central locking system, driver's side, rear
20	Door contact, central locking system, driver's side, front
KI.30B	Terminal 30 basic operation

The radio signal from the ID transmitter is received by the remote control receiver.

After the remote control receiver has verified the signal, it forwards it to the Front Electronic Module FEM. The signal causes the FEM to activate the central locking system and the interior lighting.

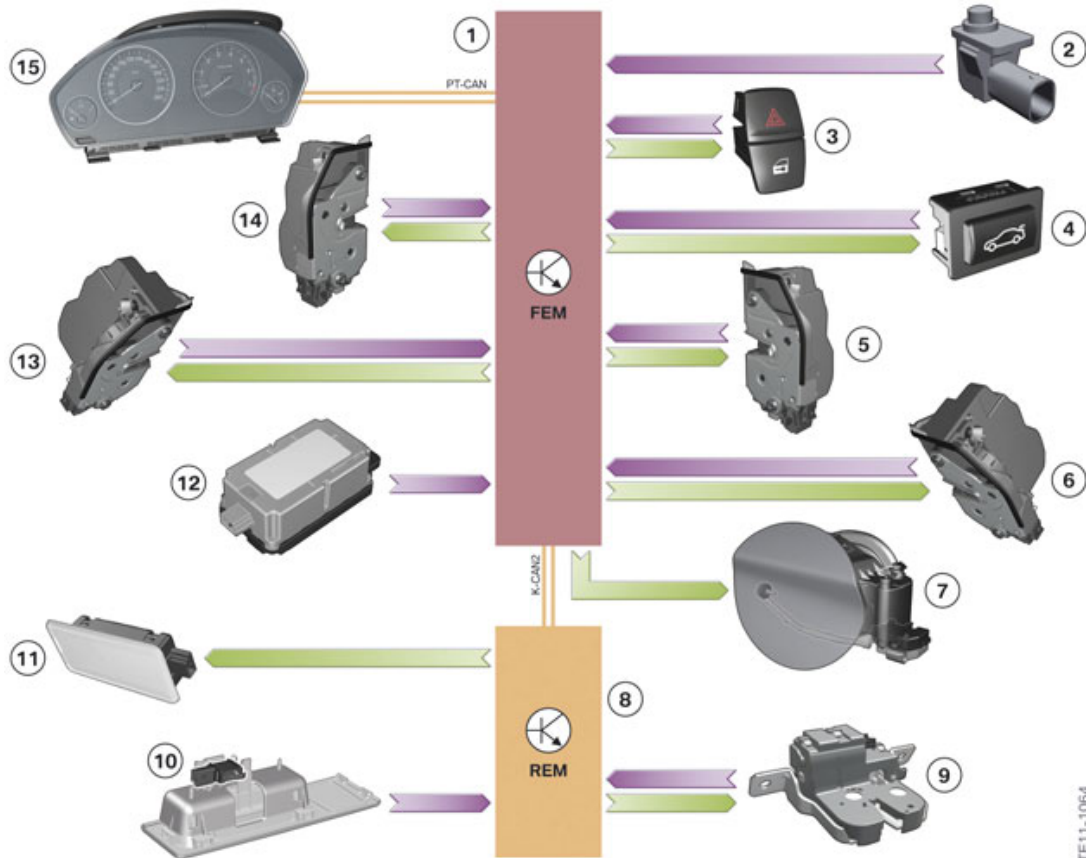
The FEM evaluates the status of all door contacts. In this way, for example, the vehicle can be prevented from being locked while the driver's door is open.

The status of the central locking system button/hazard warning switch is also evaluated by the FEM. The FEM activates the central locking system, depending on the status.

The Rear Electronic Module (REM) is responsible for sensing the status and activating the central locking system in the trunk. The FEM is responsible for the activation of the fuel filler flap.

F30 General Vehicle Electronics

8. Central Locking System



Input/output, central locking system

Index	Explanation
1	Front Electronic Module (FEM)
2	Engine compartment lid contact switch
3	Button for central locking system/hazard warning switch
4	Trunk pushbutton
5	Door contact, central locking system, front passenger side, front
6	Door contact, central locking system, front passenger side, rear
7	Central locking system, fuel filler flap
8	Rear Electronic Module (REM)
9	Trunk contact with trunk lock
10	Trunk pushbutton on the outside of the trunk
11	Luggage compartment light

F30 General Vehicle Electronics

8. Central Locking System

Index	Explanation
12	Remote control receiver
13	Door contact, central locking system, driver's side, rear
14	Door contact, central locking system, driver's side, front
15	Instrument cluster (KOMBI)

The remote control receiver checks the data telegrams of the ID transmitter and transmits them when identified correctly via the LIN bus to the FEM. The FEM evaluates the signal and causes the vehicle to be unlocked or locked.

The central locking system functions for the doors and the trunk are controlled by the FEM. The REM controls the trunk central locking system.

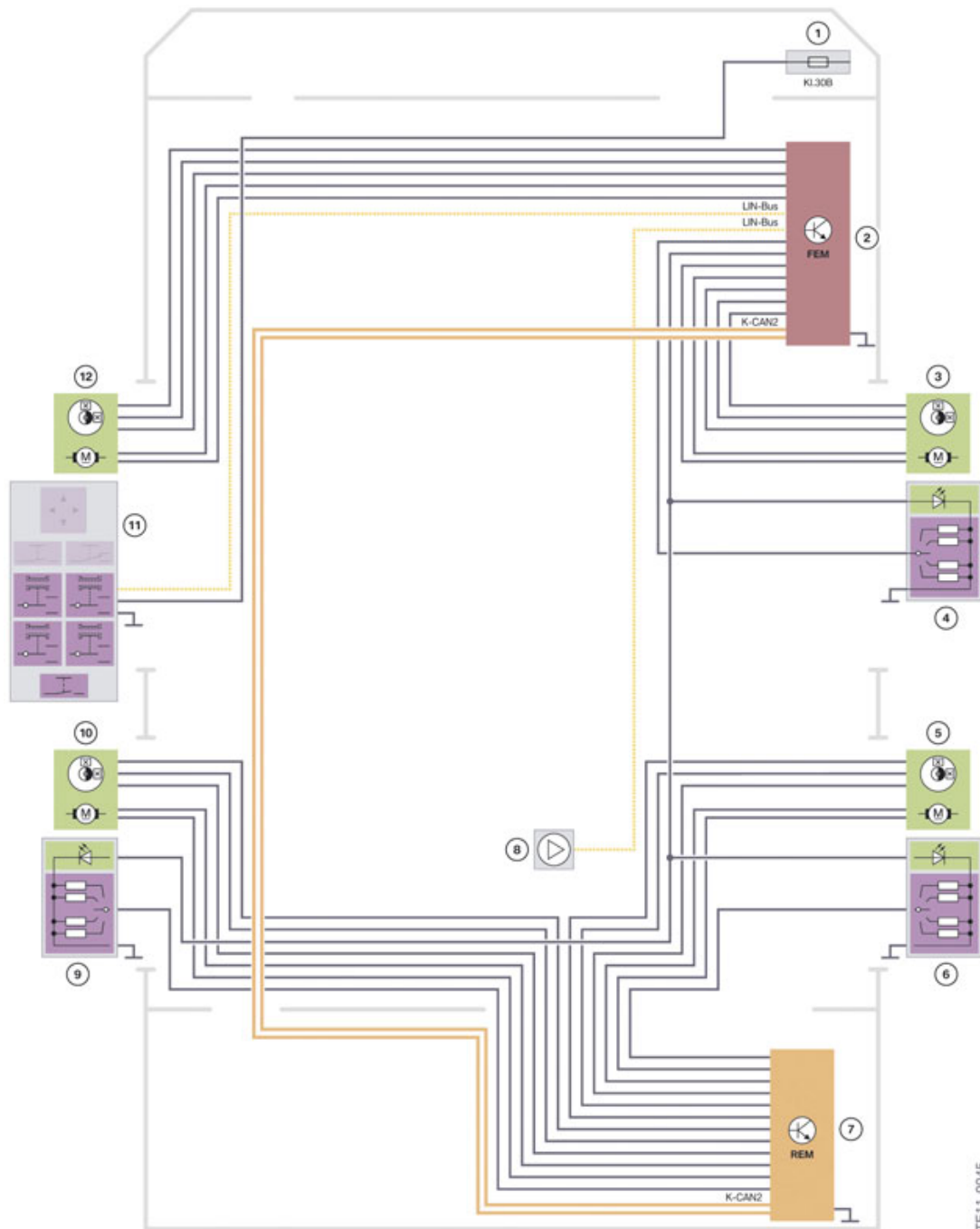
The central locking system can be operated from various positions:

- inside the vehicle
via the central locking system button on the dashboard
- outside the vehicle
via the ID transmitter or
via the door handle on the driver or front passenger door or
the trunk pushbutton on the outer trunk, for Comfort Access including Smart Opener (option 322).

F30 General Vehicle Electronics

9. Power Window Regulators

9.1. System wiring diagram



F30 system wiring diagram, power window regulators

TE11-0045

F30 General Vehicle Electronics

9. Power Window Regulators

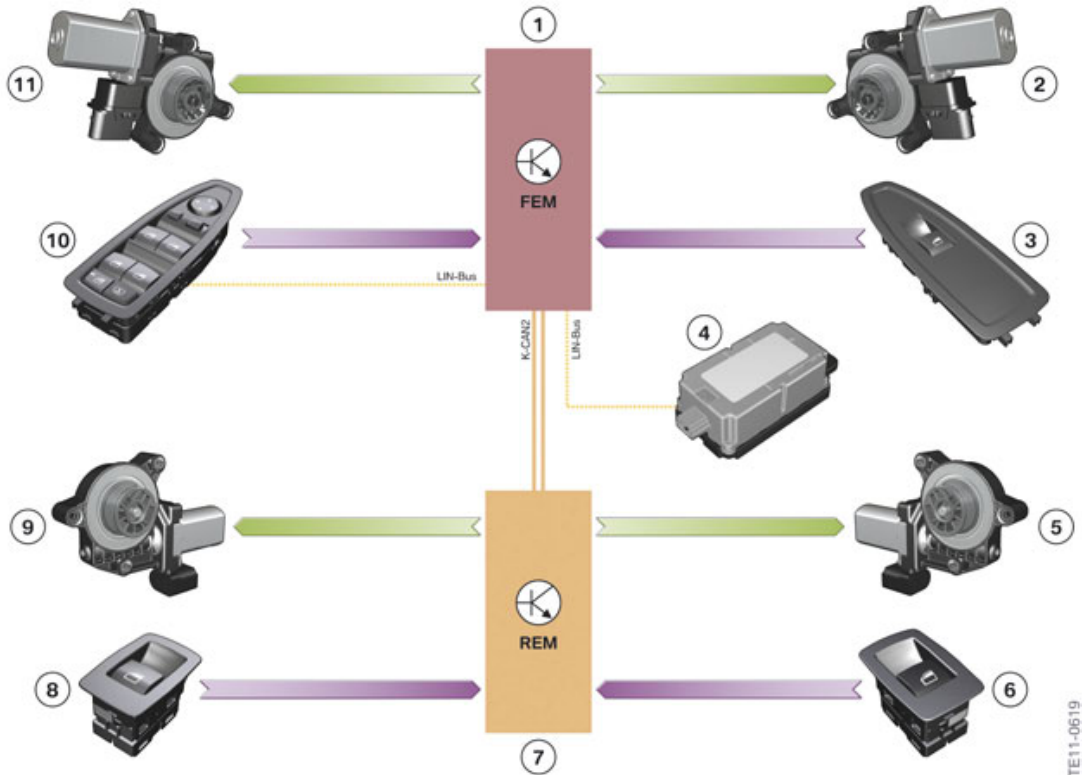
Index	Explanation
1	Power distribution box, engine compartment
2	Front Electronic Module (FEM)
3	Power window motor with indirect anti-trap mechanism, passenger side, front
4	Power window switch, front passenger side, front
5	Power window motor with indirect anti-trap mechanism, passenger side, rear
6	Power window switch, front passenger side rear
7	Rear Electronic Module (REM)
8	Remote control receiver
9	Power window switch driver's side, rear
10	Power window motor with indirect anti-trap mechanism, driver's side, rear
11	Switch block, driver's door
12	Power window motor with indirect anti-trap mechanism, driver's side, front
KI.30B	Terminal 30 basic operation

The front power window regulators are activated by the FEM. The REM assumes the activation of the rear power window regulators. The power window regulators at the front are protected directly via the FEM and the power window regulators at the rear are protected directly via the REM. The relevant load relays are integrated directly in the FEM/REM. There is therefore no need for power to be supplied via a power distribution box.

The functions with regard to comfort and anti-trap protection are already familiar from the E90.

F30 General Vehicle Electronics

9. Power Window Regulators



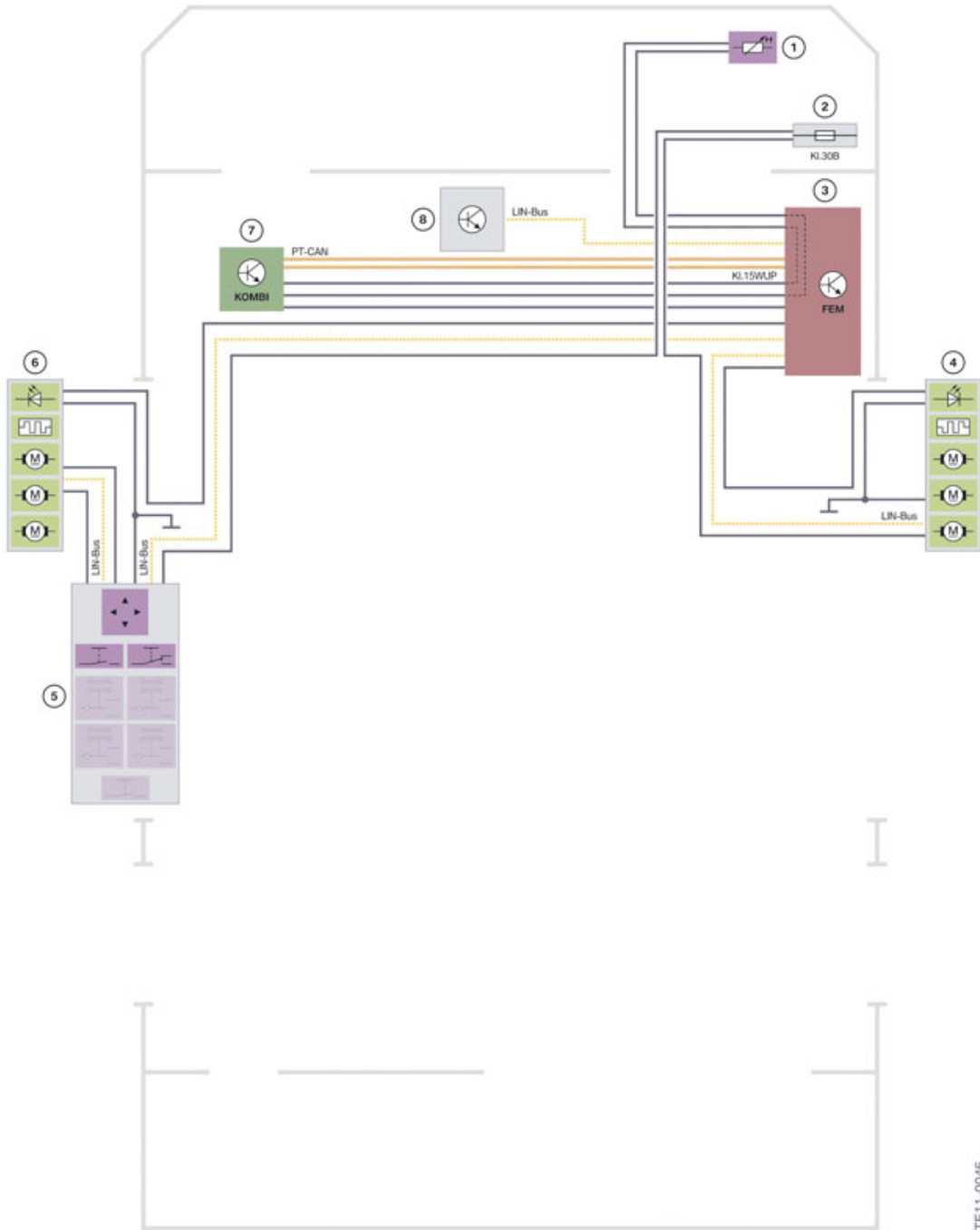
Input/output, power window regulators

Index	Explanation
1	Front Electronic Module (FEM)
2	Power window motor with indirect anti-trap mechanism, passenger side, front
3	Power window switch, front passenger side, front
4	Remote control receiver
5	Power window motor with indirect anti-trap mechanism, passenger side, rear
6	Power window switch, front passenger side rear
7	Rear Electronic Module (REM)
8	Power window switch driver's side, rear
9	Power window motor with indirect anti-trap mechanism, driver's side, rear
10	Switch block, driver's door
11	Power window motor with indirect anti-trap mechanism, driver's side, front

F30 General Vehicle Electronics

10. Exterior Mirrors

10.1. System wiring diagram



F30 system wiring diagram, exterior mirrors

TE11-0046

F30 General Vehicle Electronics

10. Exterior Mirrors

Index	Explanation
1	Outside temperature sensor
2	Power distribution box, engine compartment
3	Front Electronic Module (FEM)
4	Exterior mirror, front passenger side (turn indicator light, mirror heating, motors for folding up and down and for adjustment)
5	Switch block, driver's door
6	Exterior mirror, driver's side (turn indicator light, mirror heating, motors for folding up and down and for adjustment)
7	Instrument cluster (KOMBI)
8	Inside mirror
KI.30B	Terminal 30 basic operation

The additional side turn indicator is already integrated as standard in the exterior mirror. The side repeater is operated using a LED fibre-optic conductor.

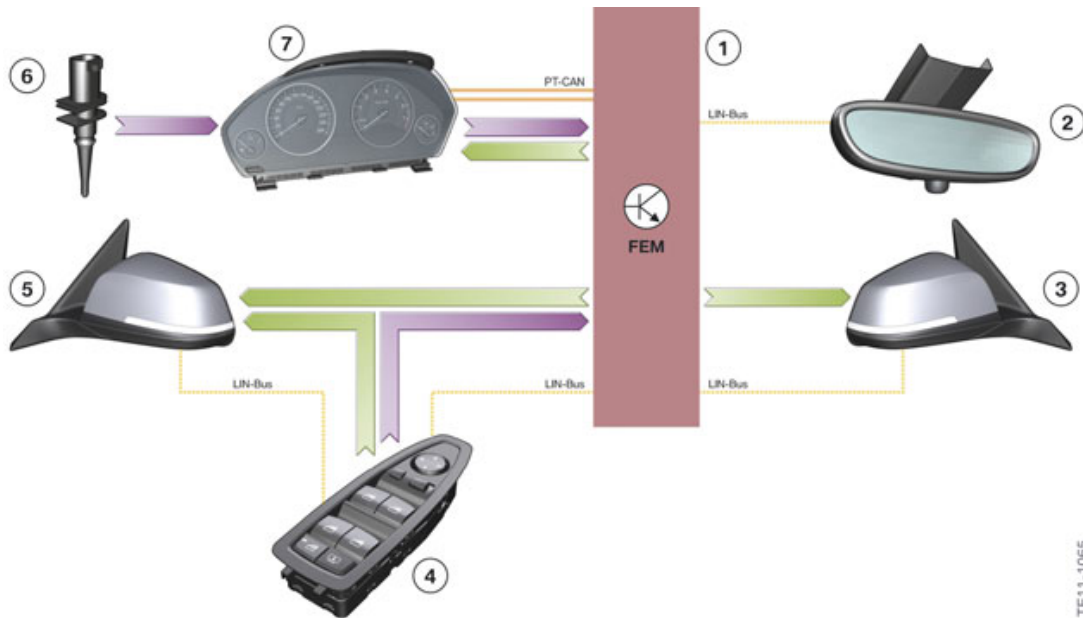
The exterior mirror of the F30 is equipped without a local interconnect network bus connection in the standard equipment.

The exterior mirror with a local interconnect network bus connection is available in the F30 with the following optional equipment:

- Interior and exterior mirrors with automatic anti-dazzle function (option 430)
- Electrical seat adjustment with memory (option 459)
- Surround View (option 5DL)
- Lane change warning (option 5AG)

F30 General Vehicle Electronics

10. Exterior Mirrors



TE11-1065

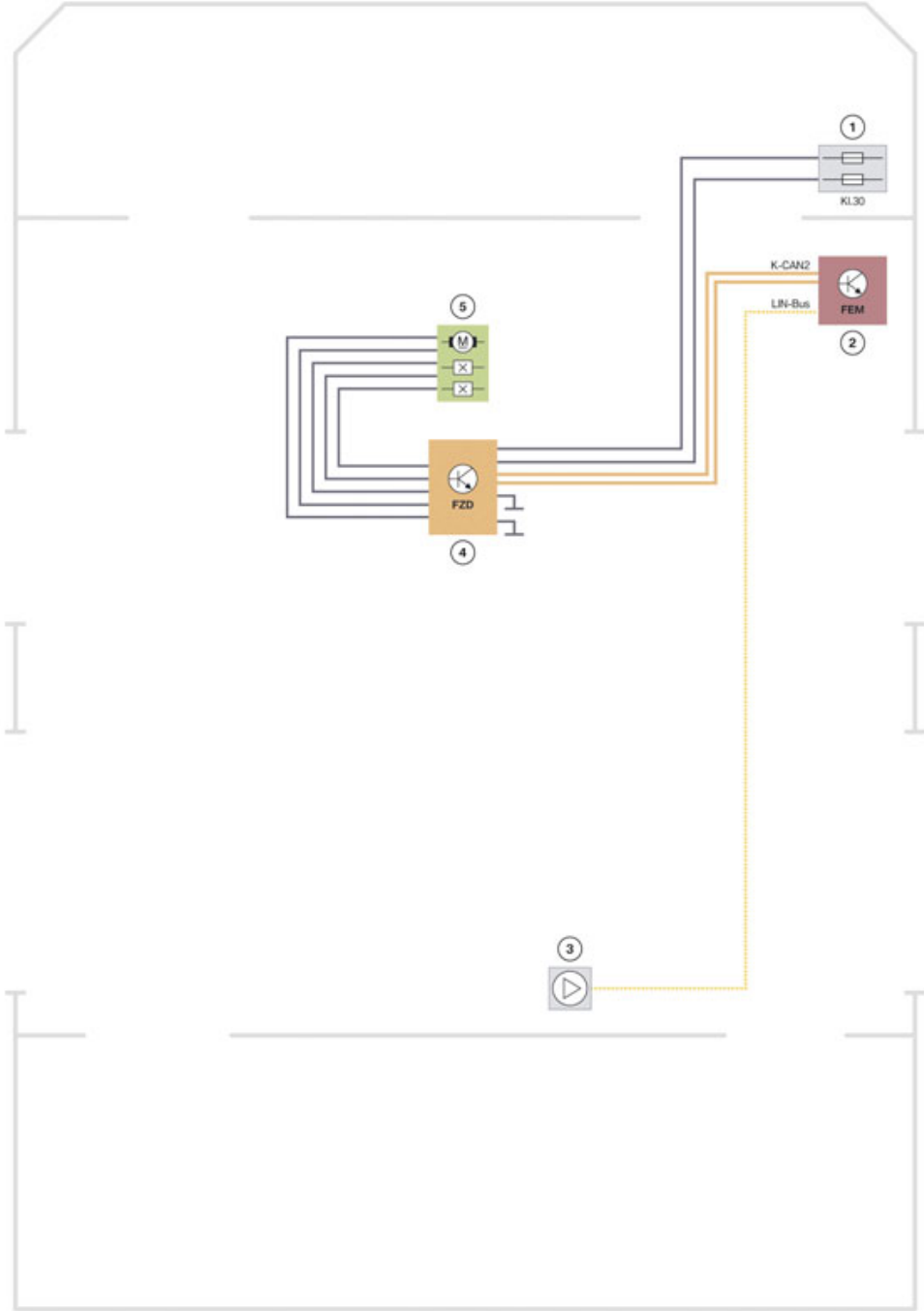
F30 Input/output, exterior mirrors

Index	Explanation
1	Front Electronic Module (FEM)
2	Inside mirror
3	Exterior mirror, front passenger side
4	Switch block, driver's door
5	Exterior mirror, driver's side
6	Outside temperature sensor
7	Instrument cluster

F30 General Vehicle Electronics

11. Glass Slide/Tilt Sunroof

11.1. System wiring diagram



F30 system wiring diagram, glass slide/tilt sunroof

TE11-1052

F30 General Vehicle Electronics

11. Glass Slide/Tilt Sunroof

Index	Explanation
1	Power distribution box, engine compartment
2	Front Electronic Module (FEM)
3	Remote control receiver
4	Roof function center (FZD)
5	Glass slide/tilt sunroof motor
Kl.30	Terminal 30

The control and monitoring of the motors of the slide/tilt sunroof takes place in the roof function center FZD.

The FZD is connected to the Front Electronic Module (FEM), which enables or disables operation of the slide/tilt sunroof. The engine compartment power distribution box delivers the voltage supply to the motors via terminal 30.



F30 Input/output, glass slide/tilt sunroof

Index	Explanation
1	Front Electronic Module (FEM)
2	Remote control receiver
3	Roof function center (FZD)
4	Glass slide/tilt sunroof motor

F30 General Vehicle Electronics

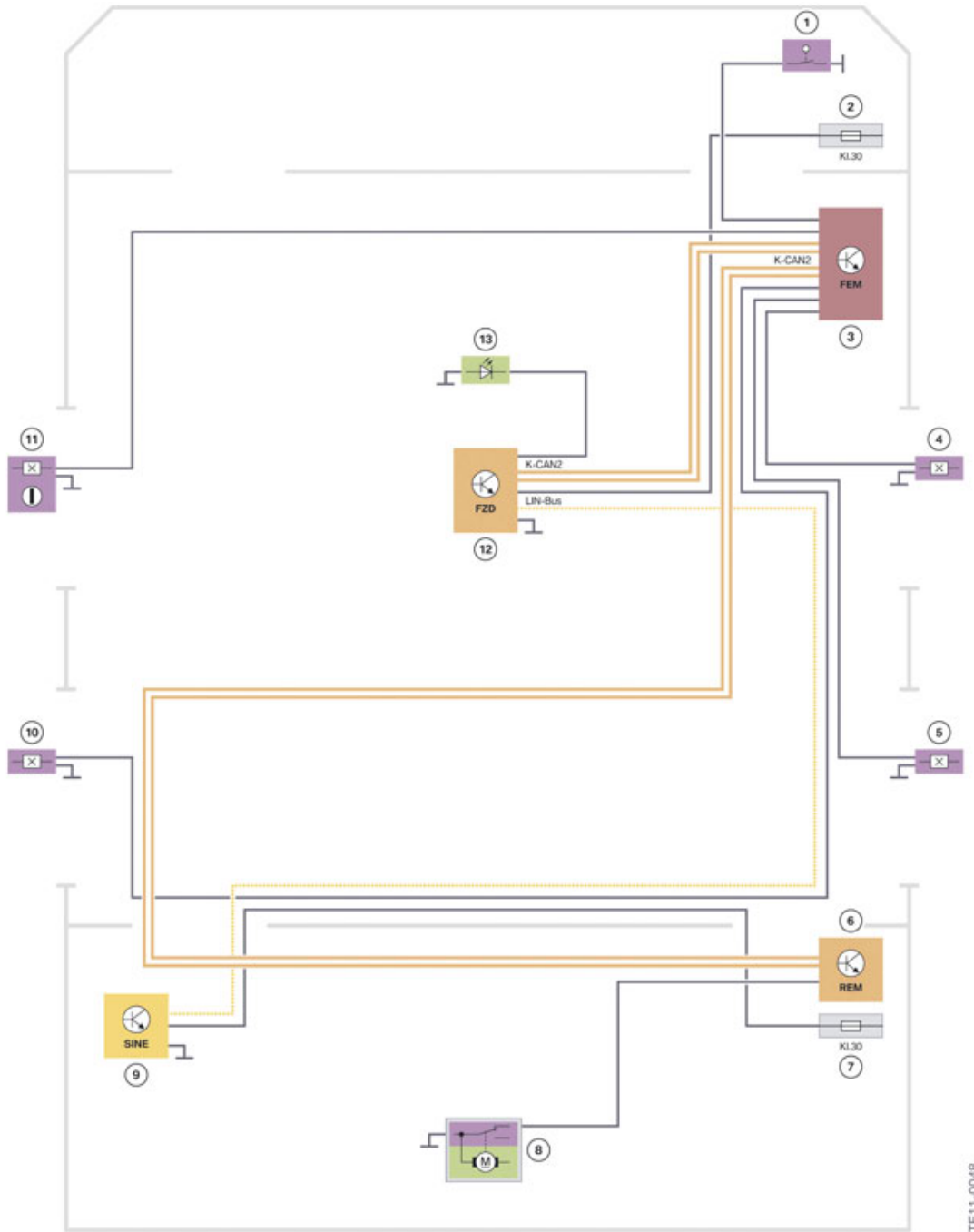
12. Alarm System

In addition to the monitoring of doors and the engine compartment lid and the trunk, the passenger compartment is also monitored in the F30 with the alarm system. Together with an ultrasonic interior movement detector (USIS), it is fully integrated in the roof function center (FZD).

F30 General Vehicle Electronics

12. Alarm System

12.1. System wiring diagram



F30 system wiring diagram, alarm system

F30 General Vehicle Electronics

12. Alarm System

Index	Explanation
1	Engine compartment lid contact switch
2	Power distribution box, engine compartment
3	Front Electronic Module (FEM)
4	Door contact, front passenger side, front
5	Door contact on front passenger side, rear
6	Rear Electronic Module (REM)
7	Power distribution box, luggage compartment
8	Trunk contact with trunk lock
9	Siren with tilt alarm sensor SINE
10	Door contact on driver's side, rear
11	Door contact, driver's side, front
12	Roof function center (FZD) USIS
13	Alarm system LED in the inside mirror
KI.30	Terminal 30

The status of the following components is monitored:

- Door contacts, from Front Electronic Module FEM
- Engine compartment lid contact switch, from Front Electronic Module FEM
- Rear lid contact switch, from Rear Electronic Module REM.

As soon as a status changes, the control unit for the ultrasonic interior movement detector USIS receives a corresponding signal via the K-CAN2. If the alarm system is activated, an alarm is triggered.

F30 General Vehicle Electronics

13. Exterior Lights

The exterior lights of the F30 are based on the current BMW models.

The F30 is equipped with halogen headlights as standard. Bi-xenon headlights are available as optional equipment (option 522).

With the optional equipment bi-xenon headlight, LEDs are used for the daytime running lights, side lights and positioning lights.

With halogen headlights, the headlight beam throw is regulated manually.

Adaptive headlights are available as optional equipment (option 524) for the F30. This is only available in conjunction with bi-xenon headlights (option 522).

The FEM as the master control unit is responsible for the exterior light functions. It decides which lighting functions have to be activated or deactivated and makes this information available to the REM via the K-CAN2. The REM in turn signals the status of the activated function in each case back to the FEM.

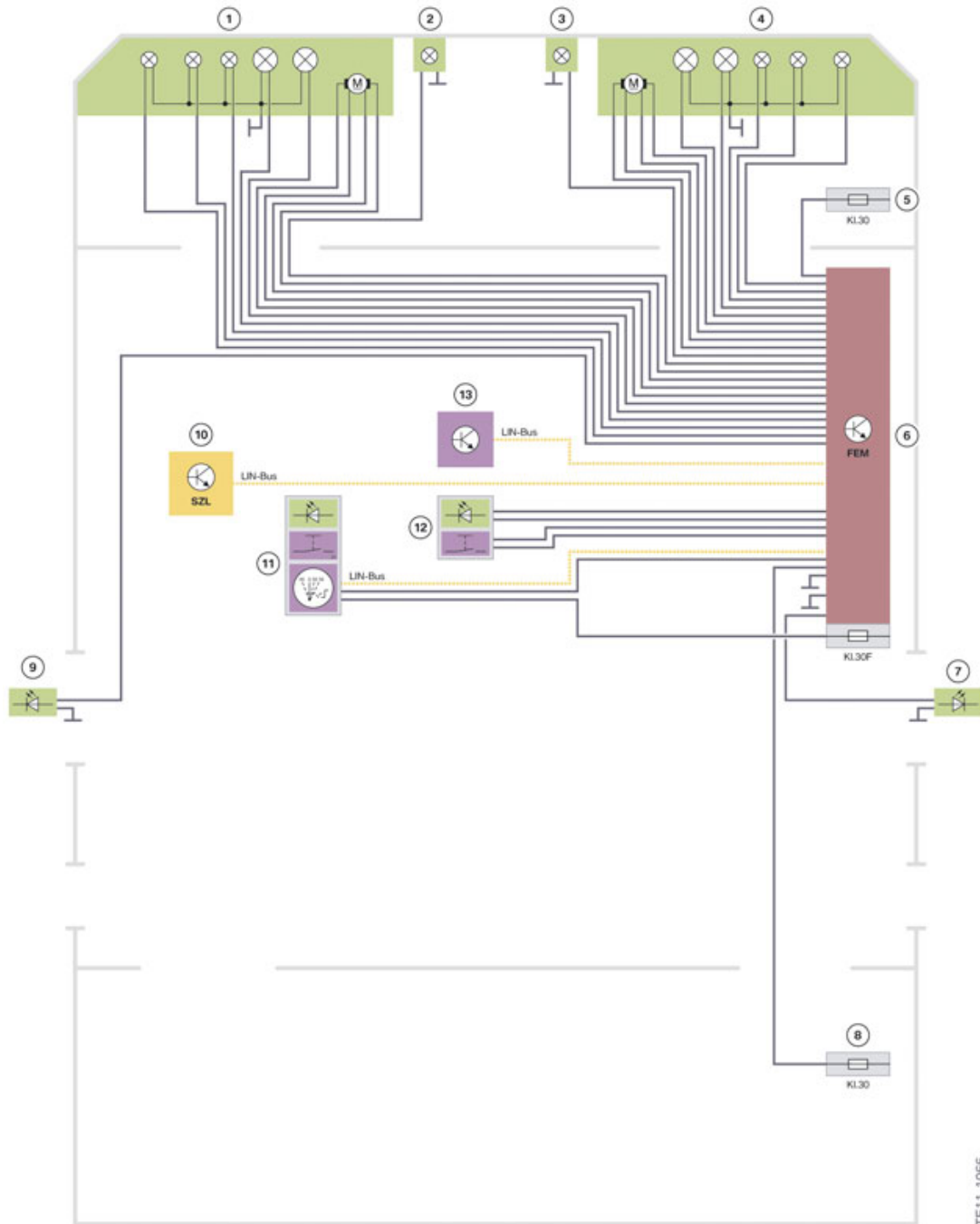
The additional LED turn indicators are in the exterior mirror. The additional turn indicators in the side panel are therefore omitted.

For more information on exterior lights, please refer to the "Exterior Lights F01/F02" training information.

F30 General Vehicle Electronics

13. Exterior Lights

13.1. System wiring diagram



F30 system wiring diagram, front exterior lights (with halogen headlights)

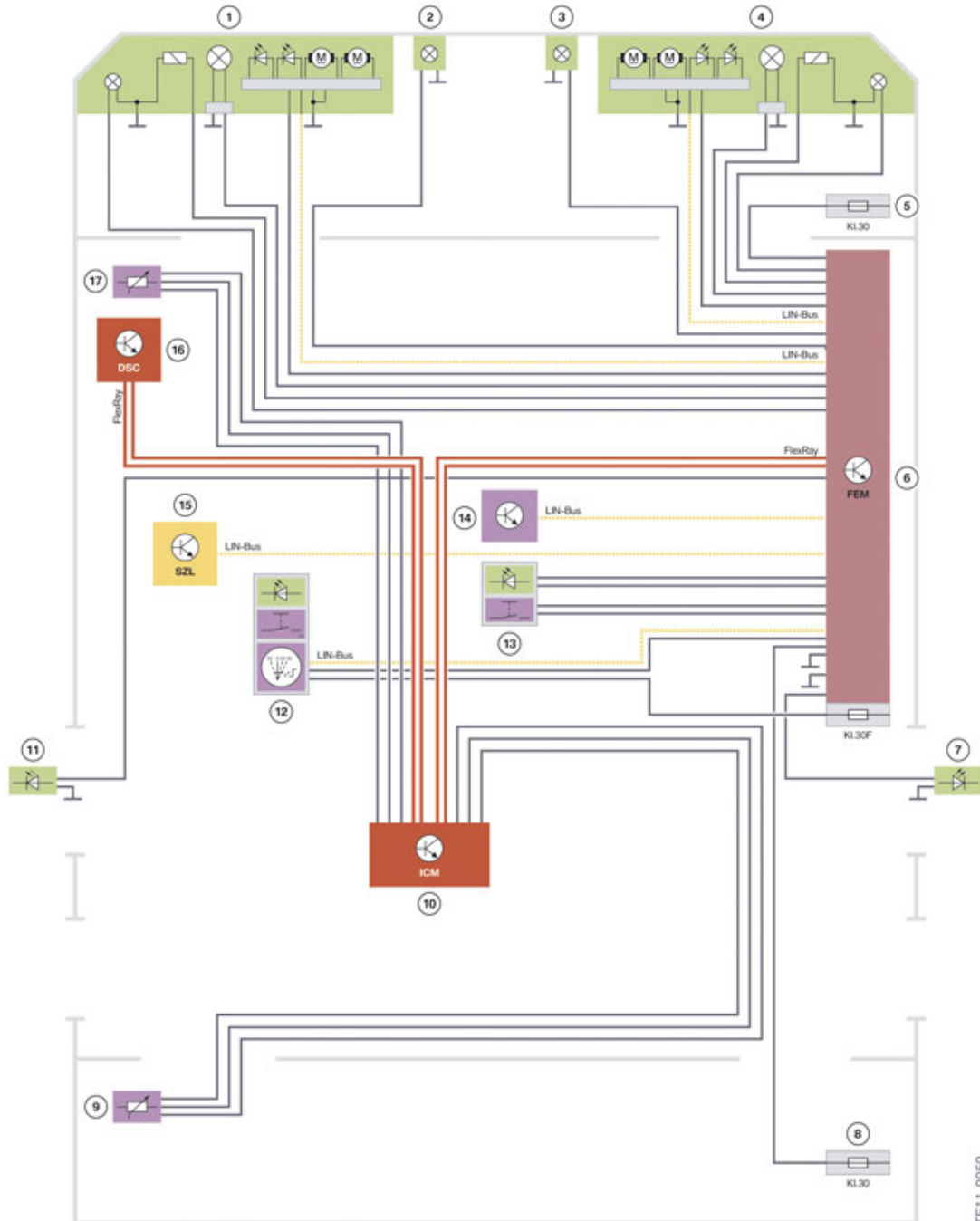
F30 General Vehicle Electronics

13. Exterior Lights

Index	Explanation
1	Headlight, left
2	Fog light, left)
3	Fog light, right
4	Headlight, right
5	Power distribution box, engine compartment
6	Front Electronic Module (FEM)
7	Additional turn indicator, exterior mirror, front passenger side
8	Battery power distribution box
9	Additional turn indicator, exterior mirror, driver's side
10	Steering column switch cluster (SZL)
11	Operating facility, light switch
12	Button for central locking system/hazard warning switch
13	Rain-light-solar-condensation sensor
KI.30	Terminal 30
KI.30F	Terminal 30, fault-dependent

F30 General Vehicle Electronics

13. Exterior Lights



F30 system wiring diagram, front exterior lights (with xenon light, option 522)

TE11-0050

F30 General Vehicle Electronics

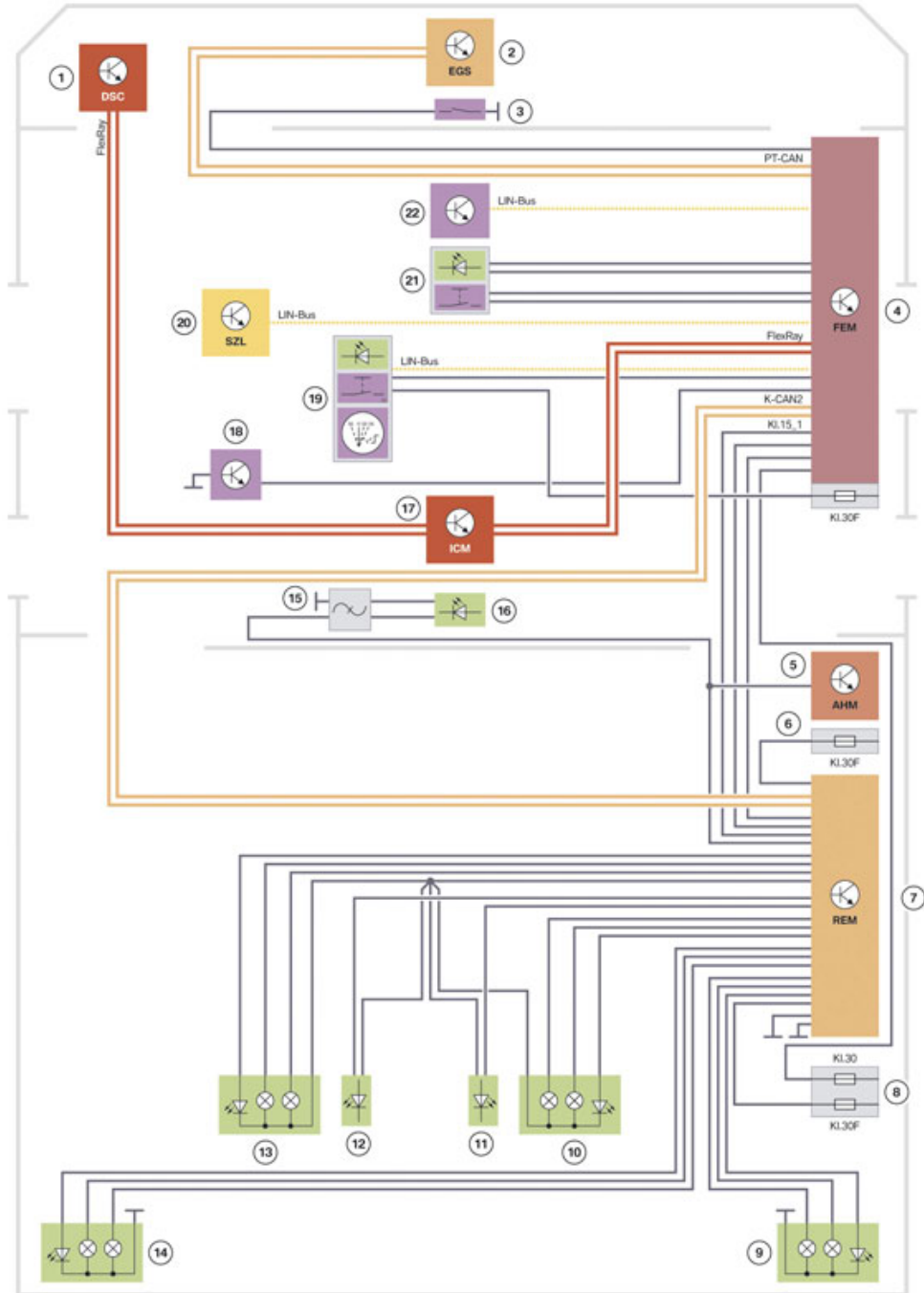
13. Exterior Lights

Index	Explanation
1	Headlight, left ¹
2	Fog light, left
3	Fog light, right
4	Headlight, right ¹
5	Power distribution box, engine compartment
6	Front Electronic Module (FEM)
7	Additional turn indicator, exterior mirror, front passenger side
8	Battery power distribution box
9	Ride height sensor, rear
10	Integrated Chassis Management (ICM)
11	Additional turn indicator, exterior mirror, driver's side
12	Operating facility, light switch
13	Button for central locking system/hazard warning switch
14	Rain-light-solar-condensation sensor
15	Steering column switch cluster (SZL)
16	Dynamic Stability Control DSC
17	Ride height sensor, front

¹ Second stepper motor only with adaptive headlight (option 524).

F30 General Vehicle Electronics

13. Exterior Lights



F30 system wiring diagram, rear exterior lights

TE11-1053

F30 General Vehicle Electronics

13. Exterior Lights

Index	Explanation
1	Dynamic Stability Control (DSC)
2	Electronic transmission control (EGS)
3	Reversing light switch
4	Front Electronic Module (FEM)
5	Trailer module (AHM) not US
6	Power distribution box, luggage compartment
7	Rear Electronic Module (REM)
8	Battery power distribution box
9	Outer rear light, right
10	Inner rear light, right (in trunk)
11	Number-plate light, right
12	Number-plate light, left
13	Inner rear light, left (in trunk)
14	Outer rear light, left
15	Interference suppression filter
16	Additional brake light
17	Integrated Chassis Management (ICM)
18	Brake light switch
19	Operating facility, light switch
20	Steering column switch cluster (SZL)
21	Button for central locking system/hazard warning switch
22	Rain-light-solar-condensation sensor
KI.30	Terminal 30
KI.30F	Terminal 30, fault-dependent

13.2. Adaptive headlights

In the F30 the adaptive headlight (option 524) is only available with the following optional equipment:

- Rain sensor (option 521)
- Xenon light (option 522)
- High-beam assistant (option 5AC).

The adaptive headlight enables dynamic lighting of the roadway thanks to a variable headlight control unit.

So as not to dazzle oncoming traffic the adaptive headlight is not active when reversing or when steering in stationary mode to the left (for left-hand drive vehicles).

F30 General Vehicle Electronics

13. Exterior Lights

The high-beam assistant/automatic high-beams (option 5AC) is dazzle-free with the adaptive headlight optional equipment. More information on the dazzle-free high-beam assistants can be found in the training information "Driver Assist Systems of the F30".

13.2.1. Function

The headlight follows the course of the road depending on the steering angle and other parameters.

For further information on the adaptive headlight, please refer to the training information "F01/F02 Exterior Lights".

13.2.2. Operation

The adaptive headlight is activated in switch position "A" when the ignition is switched on.

The cornering light is automatically activated depending on the steering angle or turn indicator.

13.2.3. Cornering light

The cornering light function is included in the adaptive headlight optional equipment. At narrow bends or when turning, one of the two fog lights is activated as a cornering light up to a speed of 65 km/h. This illuminates the inner area of the bend better. So as not to dazzle oncoming traffic, the adaptive headlight points to the front passenger side when the vehicle is stationary.



Index	Explanation
1	Without cornering light
2	With cornering light

13.2.4. Malfunction

If there is a fault with the function, the following Check Control message is displayed:

Adaptive headlight is faulty or has failed. Have the system checked as soon as possible.

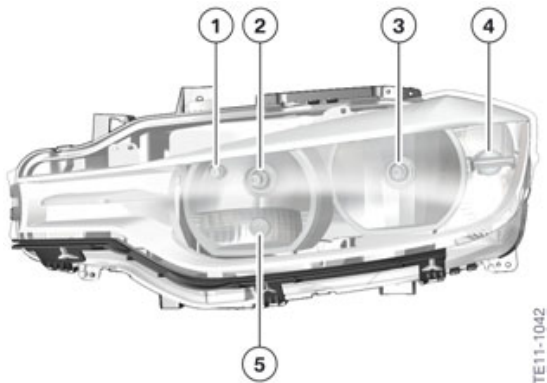
For further information on the adaptive headlight, please refer to the training information "F01/F02 Exterior Lights".

F30 General Vehicle Electronics

13. Exterior Lights

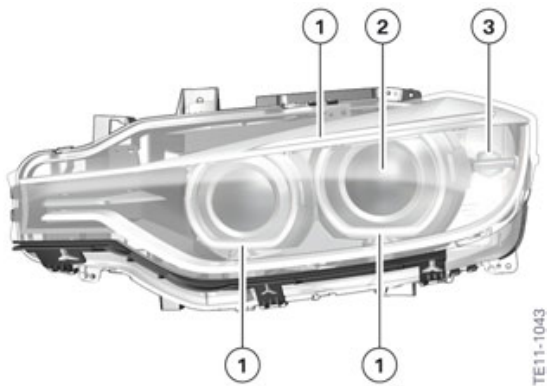
13.3. Front lights

The following graphic shows the layout of the front headlight.



F30 halogen headlight, front

Index	Explanation
1	Side lights
2	High-beam headlight
3	Low-beam headlight
4	Turn indicator
5	Daytime lights



F30 bi-xenon headlight, front

Index	Explanation
1	LED for side light/daytime driving light
2	Low-beam and high-beam headlight
3	Turn indicator

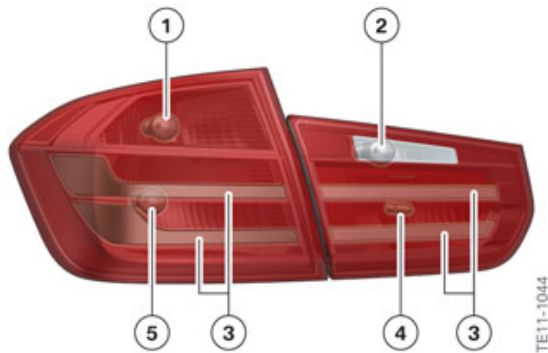
F30 General Vehicle Electronics

13. Exterior Lights

For vehicles with a xenon light (option 522) the side lights/daytime driving lights are realized via LED-operated corona rings.

13.4. Rear lights

The F30 features a two-part rear light. One part is located in the quarter panel, the other in the trunk. The layout of the rear lights is shown in the following graphic.



F30 rear light

Index	Explanation
1	Turn indicator
2	Reversing light
3	Tail light
4	Rear fog light (not US)
5	Brake light

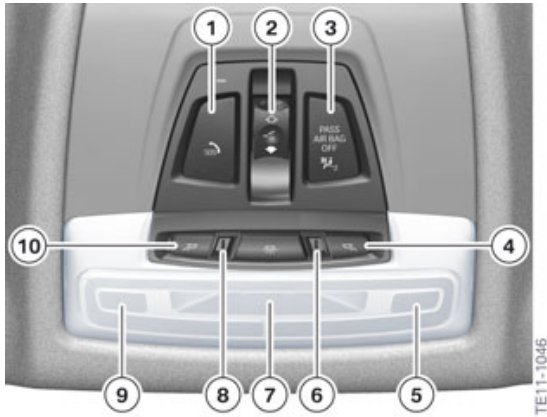
The bulbs of the rear light in the side wall are replaced by removing the lights from the vehicle. Access is done via an opening in the panel of the water channel.

F30 General Vehicle Electronics

14. Interior Lighting

The ambient light package which is standard. The luggage compartment lights are controlled by the REM. The FEM is responsible for the activation of all interior lighting.

The components of the interior lighting in the front roof area are integrated in the roof function center and in the sun visors. The footwell lighting is located on the underside of the dashboard. Voltage is supplied to the rear interior lighting via the roof function center.



F30 roof function center

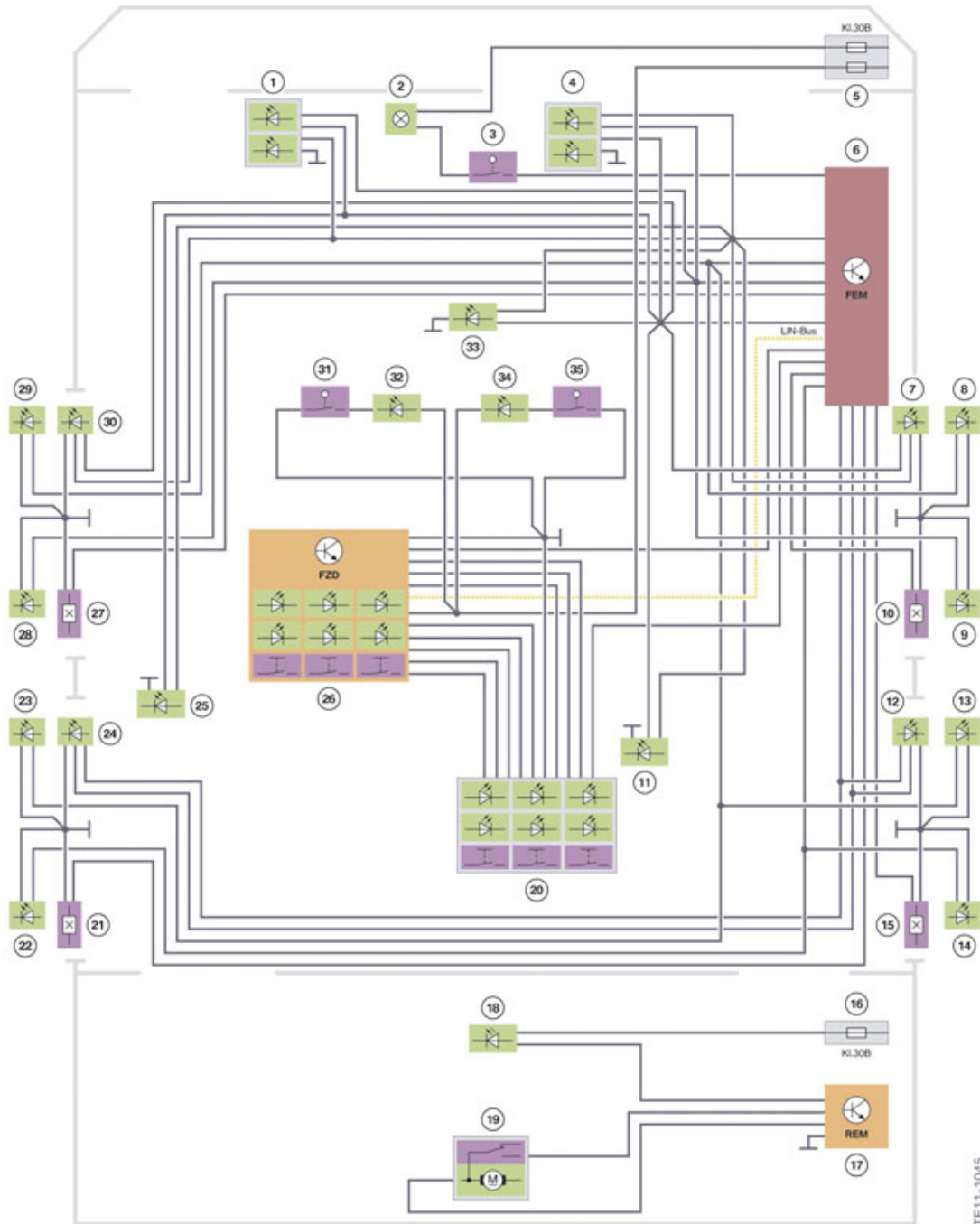
Index	Explanation
1	Emergency call button (only with option 6NL)
2	Switch for panorama glass roof
3	Indicator lamp for front passenger airbag deactivation
4	Reading light button, right
5	Reading light, right
6	Ambient lighting
7	Interior light
8	Ambient lighting
9	Reading light on left
10	Reading light button, left

In connection with the line package BMW Line Sport (PA 7AC), BMW Line Luxury (PA 7S2) or BMW Line Modern (PA 7S1), the color of the ambient lighting can be changed depending on the line. The changeover of the color and the brightness of the ambient lighting are effected in a menu in the CID. Depending on the vehicle line some of the lights are installed as switchable two-colored LEDs.

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14. Interior Lighting

14.1. System wiring diagram



F30 system wiring diagram for interior lighting

F30 General Vehicle Electronics

14. Interior Lighting

Index	Explanation
1	Footwell light on driver's side, front
2	Glove box light
3	Glove box switch
4	Footwell light on front passenger side, front
5	Power distribution box, engine compartment
6	Front Electronic Module (FEM)
7	Inside door handle light on front passenger side
8	Ground lights on outer door handle on front passenger side
9	Entrance lighting on front passenger side, front
10	Door contact, front passenger side, front
11	Lighting, B-pillar, front passenger side
12	Inside door handle light on rear passenger side
13	Ground lights on outer door handle on rear passenger side
14	Entrance lighting passenger's side, rear
15	Door contact on front passenger side, rear
16	Power distribution box, luggage compartment
17	Rear Electronic Module (REM)
18	Luggage compartment light
19	Trunk contact with trunk lock
20	Interior light unit, rear
21	Door contact on driver's side, rear
22	Entrance lighting driver's side, rear
23	Ground lights on outer door handle on rear driver's side
24	Inside door handle light on rear driver's side
25	Lighting, B-pillar, driver's side
26	Roof function center (FZD) with front interior light unit
27	Door contact, driver's side, front
28	Entrance lighting on driver's side, front
29	Ground lights on outer door handle on front driver's side
30	Inside door handle light on front driver's side
31	Switch for vanity mirror light on driver's side
32	Vanity mirror light on driver's side

F30 General Vehicle Electronics

14. Interior Lighting

Index	Explanation
33	Lighting, dashboard
34	Vanity mirror light on passenger side
35	Switch for vanity mirror light on passenger side
KI.30B	Terminal 30 basic operation

F30 General Vehicle Electronics

15. Seats

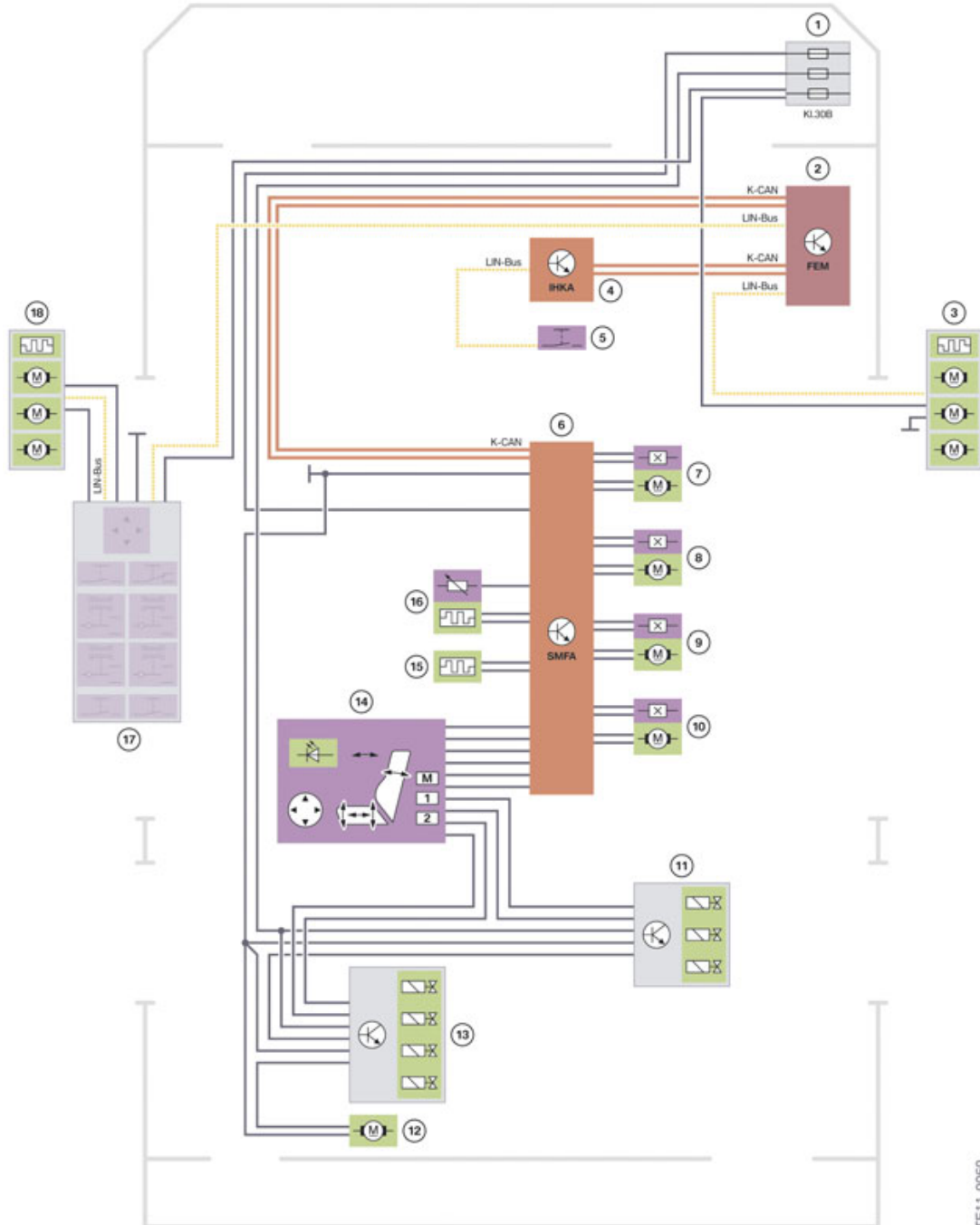
15.1. Front seats

15.1.1. System wiring diagram

⁴ Only with seat heating for driver and front passenger (option 494).

F30 General Vehicle Electronics

15. Seats



F30 system wiring diagram, front seat, driver's side (with electric seat adjustment, with memory, option 459)

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F30 General Vehicle Electronics

15. Seats

Index	Explanation
1	Power distribution box, engine compartment
2	Front Electronic Module (FEM)
3	Exterior mirror, front passenger side
4	Integrated automatic heating / air conditioning (IHKA)
5	Seat heating switch, driver's side ⁴
6	Driver's seat module (SMFA)
7	Electric motor, forward/back seat adjustment
8	Electric motor, seat angle adjustment
9	Electric motor, seat height adjustment
10	Electric motor, backrest angle adjustment
11	Solenoid valves, backrest width adjustment ¹
12	Lumbar support pump ²
13	Solenoid valves, lumbar support adjustment ³
14	Switch block, seat adjustment
15	Seat heating, backrest ⁴
16	Seat heating, seat surface ⁴
17	Switch block, driver's door
18	Exterior mirror, driver's side
Kl.30B	Terminal 30 basic operation

¹ Only with sports seats for driver and front passenger (option 481).

² Only with sports seats for driver and front passenger (option 481) or with lumbar support for driver and front passenger (option 488).

³ Only with lumbar supports for driver and front passenger (option 488).

⁴ Only with seat heating for driver and front passenger (option 494).

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems

In the F30 an integrated heating and air-conditioning system (IHKA) is used as standard equipment for the heating and air-conditioning system. In the E90 an integrated heating / air-conditioning regulation (IHKR) was used as standard equipment.

With an integrated heating / air-conditioning regulation the duct temperature is adjusted to the value set using the control panel. In contrast, with an integrated heating / air-conditioning system the interior temperature of the vehicle is also taken into consideration when controlling the duct temperature. If the interior temperature deviates greatly from the set temperature, the duct temperature is then controlled at a lower or higher value than the set temperature in order to quickly reach the set temperature.

The IHKA of the F30 therefore has an additional interior temperature sensor installed in the control panel. The sensor data is digitized in the control panel and the information transmitted to the IHKA control unit via the local interconnect network bus. Thanks to a computer model integrated in the IHKA controls, the forced ventilation of the interior temperature sensor in the F30 could be discontinued. The duct temperature is measured using sensors in the ventilation system, which are connected directly to the IHKA control unit.

- Integrated automatic heating / air conditioning (IHKA), 2/1-zone.

In the zone specification the first number denotes the number of controllable temperature zones (temperature selector wheels) and the second number the number of controllable airflow volume and air distribution zones (separate fan settings).

16.1. Sensors and actuators

Sensors and actuators which are connected to the FEM control unit are involved in the function of the heating and air conditioning system in the F30. The following list provides an overview of these components:

- Refrigerant circuit pressure sensor
The FEM evaluates the pressure sensor signal and makes it available to the IHKA control unit via K-CAN
- Blower
The IHKA control unit request is sent via the LIN bus to the blower
- A/C compressor
The A/C compressor is controlled via a pulse-width modulated signal by the FEM. The FEM can also actuate the A/C compressor clutch. The request is always effected however through the IHKA control unit. In the event of a fault, a fault entry is made by the FEM.
- Heat exchanger water valve
- Stepper motors
 - Nine stepper motors for IHKA 2/1 zones
- Rear-seat area ventilation sensor
The FEM evaluates the signal from the rear-seat area ventilation sensor and makes it available to the IHKA control unit via the K-CAN.

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems

16.2. Features

16.2.1. IHKA features

- Improved protection of the blower motor through closed area of the blower wheel
 - Protection of the blower motor against water and contaminants
- One-piece microfilter on the pressure side of the blower
 - Air filtering also in air recirculation function, thus improved air quality
 - Reduced build-up of odors, as well as less corrosion on evaporator
- Separation of IHKA controls and IHKA control unit
 - The IHKA control unit is now located at the heating and air-conditioning unit
 - Communication between IHKA controls and IHKA control unit by means of local interconnect network bus via the audio control panel
- Air-conditioning with clutch
In the case of a switched-off air-conditioning system the compressor is separated from the belt drive by a clutch, the load on the engine is therefore less thus saving on fuel
- ECO PRO function
 - Climate control
Less air-drying and cooling, thus less drive power required for A/C compressor
A/C compressor is switched off if required temperature is reached also without cold-air generation
 - Heating mode
Dispensed with operating mode of combustion engine with increased heat dissipation.

16.2.2. Additional Functions of the IHKA

- Operable stratification
- Air flaps are individually activated using 9 stepper motors
- Temperature for rear-seat area ventilation can be adjusted
The FEM evaluates the signal from the rear-seat area ventilation sensor and makes it available to the IHKA control unit via the K-CAN.

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems

16.3. 2/1-zone IHKA

16.3.1. Control panel

In the F30 the IHKA 2/1 zones control panel is installed.

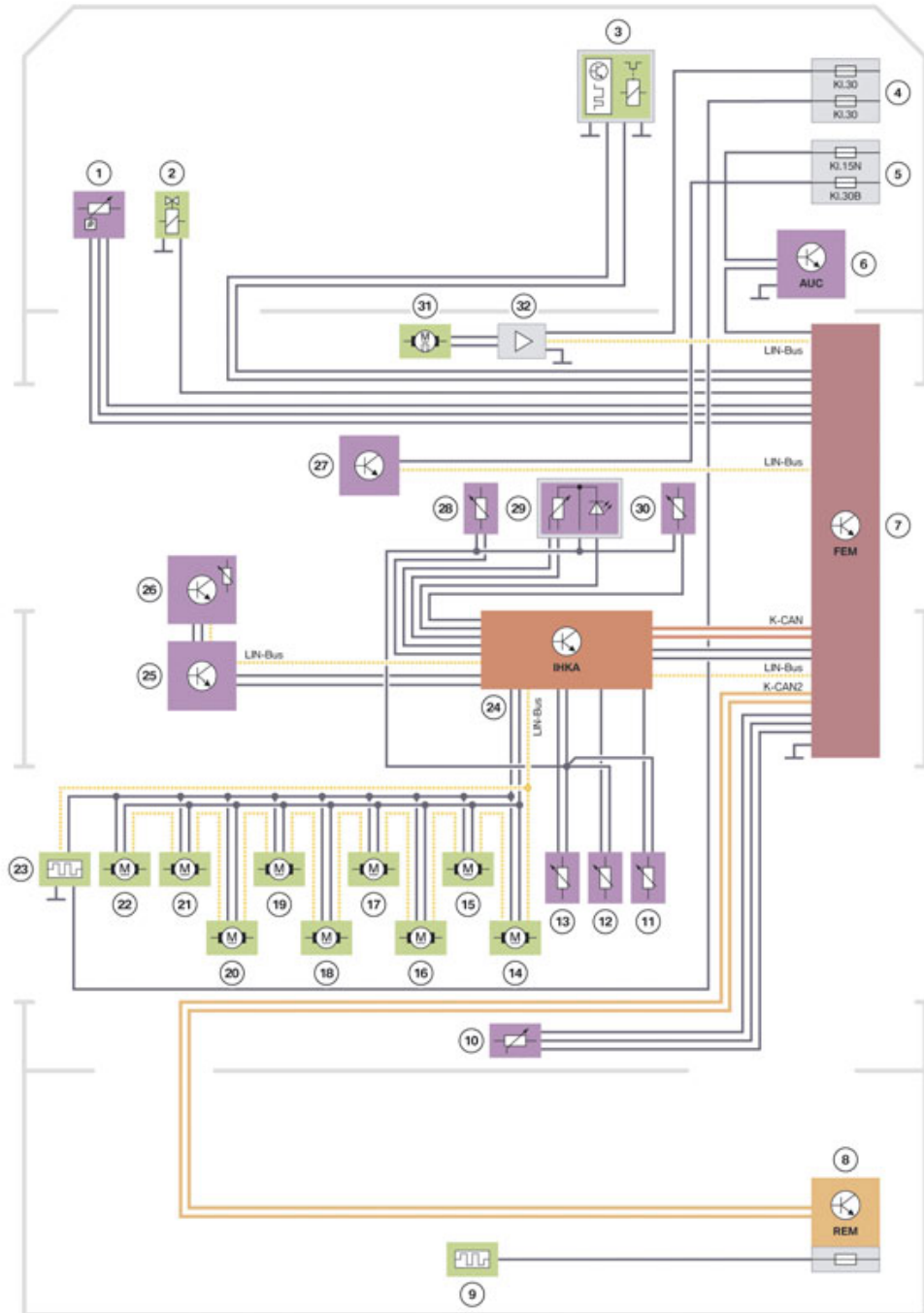


F30 control panel, IHKA 2/1 zones

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems

16.3.2. System wiring diagram



F30 system wiring diagram, IHKA 2/1 zones

TE11-1059

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems

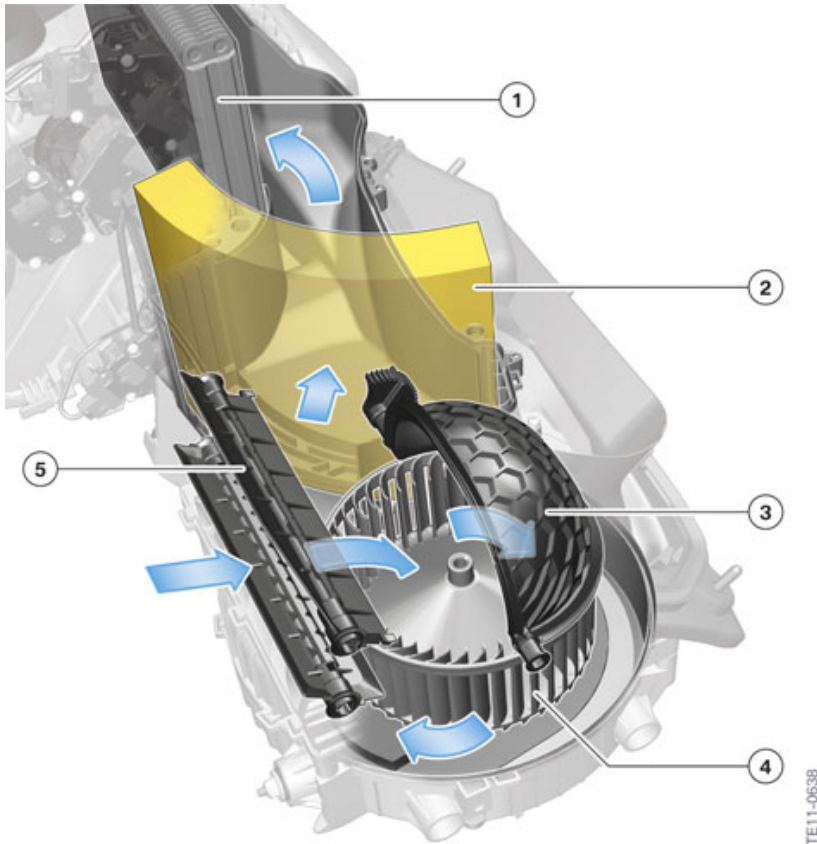
Index	Explanation
1	Refrigerant circuit pressure sensor
2	Heat exchanger water valve
3	A/C compressor
4	Power distribution box, front
5	Power distribution box, engine compartment
6	Automatic air recirculation control sensor
7	Front Electronic Module (FEM)
8	Rear Electronic Module (REM)
9	Heated rear window
10	Stratification potentiometer for rear-seat area ventilation
11	Temperature sensor for evaporator
12	Temperature sensor, footwell, front right
13	Temperature sensor, footwell, front left
14	Stepper motor, mixing air flap, left
15	Stepper motor, mixing air flap, right
16	Stepper motor, fresh air/ram air/recirculated air
17	Stepper motor, stratification, front right
18	Stepper motor, stratification, front left
19	Stepper motor, temperature, air quantity, rear passenger compartment
20	Stepper motor, footwell, right
21	Stepper motor, footwell, left
22	Stepper motor, defrost
23	Electric auxiliary heater (only for diesel fuel vehicles)
24	IHKA control unit
25	Audio control panel
26	IHKA controls with interior temperature sensor
27	Rain-light-solar-condensation sensor
28	Ventilation temperature sensor, left
29	Stratification potentiometer for front ventilation
30	Ventilation temperature sensor, right
31	Blower
32	Blower output stage
KI.30	Terminal 30
KI.30B	Terminal 30 basic operation
KI.15N	Ignition (after-run)

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16. Heating/Air Conditioning Systems

16.4. Microfilter

The microfilter is installed on the pressure side of the blower. This reduces air contaminants in both fresh-air and air recirculation modes. Evaporator corrosion and the build-up of odors are also reduced.

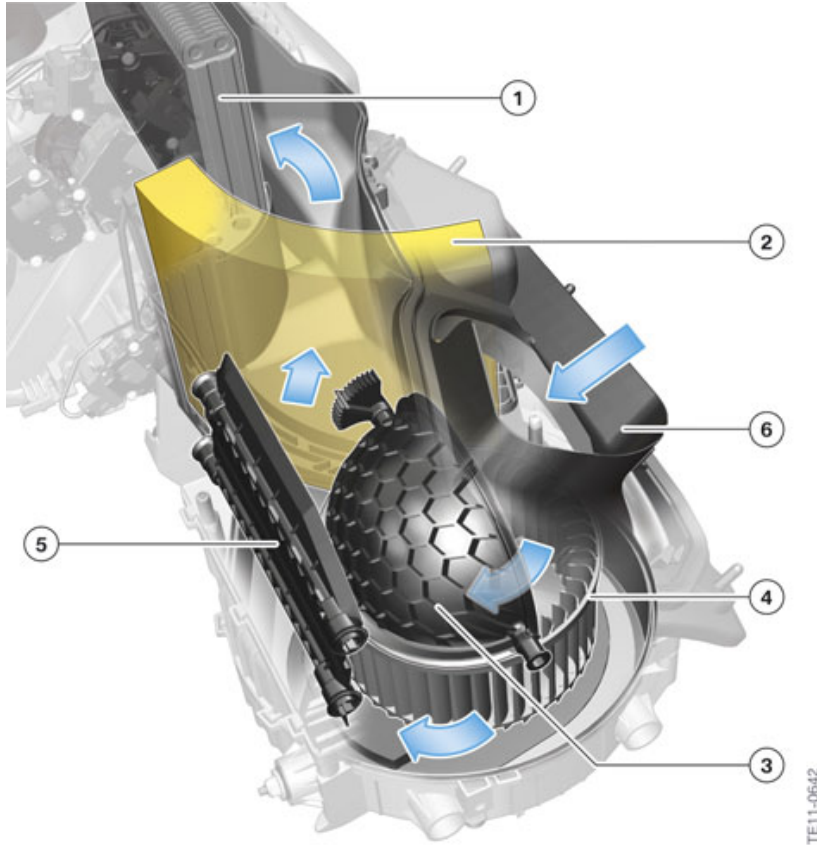


Air route in the heating and air conditioning system (air recirculation mode)

Index	Explanation
1	Evaporator
2	Filter
3	Recirculated air flap
4	Blower
5	Recirculated air inlet flap (opened)

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems



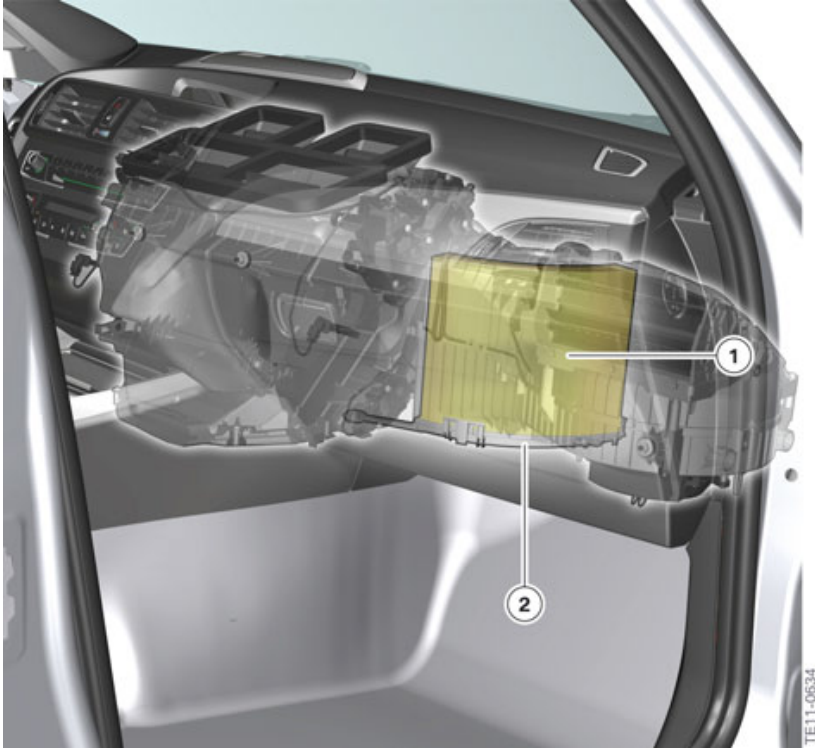
Air route in the heating and air conditioning system (fresh-air mode)

Index	Explanation
1	Evaporator
2	Filter
3	Recirculated air flap
4	Blower
5	Recirculated air inlet flap (closed)
6	Fresh air inlet

The one-part microfilter is located in the F30 behind the glove box and can be easily replaced through the footwell on the passenger side.

F30 General Vehicle Electronics

16. Heating/Air Conditioning Systems



Microfilter

Index	Explanation
1	Microfilter
2	Filter cover



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